

CURRICULUM VITAE
Ali Javey, Ph.D.

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Date of Birth: December 3, 1980

Academic Appointments

2017-
present *Lam Research Distinguished Chair in Semiconductor Processing*
Electrical Engineering and Computer Sciences
University of California at Berkeley

2015-
2017 *Conexant Systems Distinguished Professor*
Electrical Engineering and Computer Sciences
University of California at Berkeley

2014-
present *Professor*
Electrical Engineering and Computer Sciences
University of California at Berkeley

2010-
2014 *Associate Professor*
Electrical Engineering and Computer Sciences
University of California at Berkeley

2005 –
2010 *Assistant Professor*
Electrical Engineering and Computer Sciences
University of California at Berkeley
(2005-2006, on leave)

2019 -
present *Senior Faculty Scientist*
Materials Sciences Division
Lawrence Berkeley National Laboratory

2006 -
2019 *Faculty Scientist*
Materials Sciences Division
Lawrence Berkeley National Laboratory

2011-
present *Program Leader*
Electronic Materials
Lawrence Berkeley National Laboratory

2011-
2023 *Associate Editor*
ACS Nano

2011- 2018	<i>Co-Director</i> Bay Area PV Consortium - DOE funded program (\$25 million for 5 years)
2008- Present	<i>Co-Director</i> Berkeley Sensor and Actuator Center (BSAC) – NSF/industry funded research center at UC Berkeley with ~40 member companies.
2019- present	<i>Co-Founder & Chief Scientist</i> Serinus Labs
2005 - 2006	<i>Junior Fellow</i> Harvard Society of Fellows Harvard University

Faculty Affiliations

2007 -	Applied Science & Technology Graduate Program, UC Berkeley
2006 -	Nanoscale Science & Engineering Graduate Group, UC Berkeley
2019 -	Kavli Energy Nanoscience Institute, UC Berkeley

Education

2005	Ph.D., Physical Chemistry, Stanford University
2001	B.S., Chemistry, Old Dominion University

Research Interests

high performance nanoelectronics; flexible electronics and sensors;
nanofabrication; energy harvesting and conversion; programmable matter

Awards and Honors

2023	<i>IEEE Fellow</i>
2020	<i>Dan Maydan Prize in Nanoscience Research</i>
2016	<i>Bakar Fellow (UC Berkeley)</i>
2015	<i>MRS Outstanding Young Investigator Award</i>
2014	<i>Nano Letters Young Investigator Lectureship</i>
2014	<i>Blavatnik National Award for Young Scientists Finalist</i>
2012	<i>UC Berkeley Electrical Engineering Outstanding Teaching Award</i>
2011	<i>APEC Science Prize for Innovation, Research and Education</i>
2011	<i>Netexplorateur of the Year Award</i>
2010	<i>IEEE Nanotechnology Early Career Award</i>
2010	<i>Alfred P. Sloan Research Fellow</i>
2010	<i>Mohr Davidow Ventures (MDV) Innovator Award</i>
2009	<i>MIT Technology Review TR35</i>

2009	<i>National Academy of Sciences Award for Initiatives in Research</i>
2008	<i>National Science Foundation CAREER Award</i>
2008	<i>U.S. Frontiers of Engineering, National Academy of Engineering</i>
2004	<i>Election to Harvard Society of Fellows, Junior Fellow</i>
2004	<i>MRS Graduate Student Gold Award</i>
2003-2005	<i>Semiconductor Research Corporation Peter Verhofstadt Fellowship</i>
2001	<i>Hampton Roads Section of the American Chemical Society (ACS) Award to the Outstanding Graduating Senior in Chemistry</i>
1998-2001	<i>Tidewater Builders Association Scholarship</i>

University Service:

EECS Department

- Faculty Recruiting - Chair (EE): 2021-2024; Member: 2008-2011, 2019-2024
- Ph.D. Admissions – Chair (EE): 2016-2018; Member: 2006-2012
- Student Awards – Chair (EE): 2014-2016; Member: 2013-2016
- Undergraduate Study – Member: 2018-2019
- Executive Committee – Member: 2023-2024

College

- MSE Faculty Recruiting - Member: 2012-2013; 2020-2021
- Undergraduate Transfer Admissions – Member: 2010-2011, 2018-2019
- Engineering Ethics and Social Responsibilities – Member: 2010-2011

Campus and Systemwide

- Faculty Awards (Academic Senate; Berkeley Division) – Chair: 2019-2021; Member: 2017-2019
- Committee on Committees (Academic Senate; Berkeley Division) – Member: 2022-2023
- Privilege and Tenure (Academic Senate; Berkeley Division) – Member: 2024-
- University Committee on Committees (Academic Senate; Systemwide) – Member: 2023-2024
- University Fellowship Committee – Member: 2014-2019
- BNNI Executive Committee – Member: 2013 –
- AS&T Executive Committee - Member: 2019 –
- Undergraduate Admissions – Member: 2015-2016

Book & Book Chapter:

1. A. Javey, J. Kong (Eds.), "*Carbon Nanotube Electronics*", (Springer, New York, 2009).
2. Z. Fan, J. C. Ho, A. Javey, "Progresses and Challenges of Nanowire Integrated Circuitry", in *Nanoelectronics: Nanowires, Molecular Electronics, and Nanodevices*, Ed. K. Iniewski, (McGraw-Hill, New York, 2010).

Publications: (>75,000 citations, h-index= 132; Google Scholar,3/2024)

1. N. Davis, J. Heikenfeld, C. Milla, A. Javey, "The challenges and promise of sweat sensing", *Nature Biotechnology*, in press, 2024 (<https://doi.org/10.1038/s41587-023-02059-1>).
2. J. I. Kim, N. Higashitarumizu, S. Wang, R. Yalisove, M. C. Scott, S. Y. Song, A. Javey, "Multicolor Inks of Black Phosphorus for Midwave-Infrared Optoelectronics", *Advanced Materials*, 2402922, 2024.
3. J Li, R Yang, N Higashitarumizu, S Dai, J Wu, A Javey, CP Grigoropoulos, "Transient Nanoscopy of Exciton Dynamics in 2D Transition Metal Dichalcogenides", *Advanced Materials*, 36 (21), 2311568, 2024.
4. N. Higashitarumizu, T. Kawashima, T. Smart, R. Yalisove, C. Y. Ho, M. Madsen, D. C. Chrzan, M. C. Scott, R. Jeanloz, H. Yusa, A. Javey, "Mid-Infrared, Optically Active Black Phosphorus Thin Films on Centimeter Scale", *Nano Letters*, 10, 3104-3111, 2024.
5. S. Wang, N. Higashitarumizu, B. Sari, M. C. Scott, A. Javey, "Quantitative Mid-infrared Photoluminescence Characterization of Black Phosphorus–Arsenic Alloys", *ACS Nano*, 18, 5907–5914, 2024.
6. N. Higashitarumizu, S. Tajima, J. Kim, M. Cai, A. Javey, "Long operating lifetime mid-infrared LEDs based on black phosphorus", *Nature Communications*, 14, 4845, 2023.
7. V. Wang, S. Z. Uddin, J. Park, A. Javey, "Highly multicolored light emitting arrays for compressive spectroscopy", *Science Advances*, 9, eadg1607, 2023.
8. N. Higashitarumizu, S. Z. Uddin, D. Weinberg, N. S. Azar, I. K. M. R. Rahman, V. Wang, K. B. Crozier, E. Rabani, A. Javey, "Anomalous thickness dependence of photoluminescence quantum yield in black phosphorous", *Nature Nanotechnology*, 18 (5), 507-513, 2023.
9. Jongchan Kim, Vivian Wang, Seung Chan Kim, Jun Yeob Lee, Ali Javey, "A Color-Tunable Alternating Current Organic Light Emitting Capacitor", *Nano Letters*, 23, 12, 5822–5827, 2023.
10. A. Aggarwal, M. Dautta, L. F. Ayala-Cardona, A. Wudaru, A. Javey, "Wearable Humidity Sensor for Continuous Sweat Rate Monitoring", *Advanced Materials Technologies*, 2023 (DOI - <https://doi.org/10.1002/admt.202300385>).
11. S. Balendhran, M. Taha, S. Wang, W. Yan, N. Higashitarumizu, D. Wen, N. Sefidmooye Azar, J. Bullock, P. Mulvaney, A. Javey, K. B. Crozier, "Flexible Vanadium Dioxide Photodetectors for Visible to Longwave Infrared Detection at Room Temperature", *Advanced Functional Materials*, 2023 (DOI - <https://doi.org/10.1002/adfm.202301790>).

12. Kaichen Dong, Jiachen Li, Tiancheng Zhang, Fangda Gu, Yuhang Cai, Niharika Gupta, Kechao Tang, Ali Javey, Jie Yao, Junqiao Wu, "Single-pixel reconstructive mid-infrared micro-spectrometer", *Optics Express*, 31, 9, 14367-14376, 2023.
13. G. H. Ahn, A. D. White, H. Kim, N. Higashitarumizu, F. M. Mayor, J. F. Herrmann, W. Jiang, K. K.S. Multani, A. H. Safavi-Naeini, A. Javey, J. Vučković, "Platform-agnostic waveguide integration of high-speed photodetectors with evaporated tellurium thin films", *Optica*, 10, 3, 349-355, 2023.
14. Y. Luo, et al, "Technology Roadmap for Flexible Sensors", *ACS Nano*, 17, 6, 5211–5295, 2023.
15. J. M. Buriak, et al, "Best Practices for Using AI When Writing Scientific Manuscripts: Caution, Care, and Consideration: Creative Science Depends on It", *ACS Nano*, 17, 5, 4091–4093, 2023.
16. T. Schenkel, A. M. Snijders, K. Nakamura, P. A. Seidl, B. Mak, L. Obst-Huebl, H. Knobel, I. Pong, A. Persaud, J. van Tilborg, T. Ostermayr, S. Steinke, E. A. Blakely, Q. Ji, A. Javey, R. Kapadia, C. G. R. Geddes, E. Esarey, "Carbon nanotube substrates enhance SARS-CoV-2 spike protein ion yields in matrix-assisted laser desorption–ionization mass spectrometry", *Applied Physics Letters*, 122, 050601, 2023.
17. M. Dautta, L. F. Ayala-Cardona, N. Davis, A. Aggarwal, J. Park, S. Wang, L. Gillan, E. Jansson, M. Hietala, H. Ko, J. Hiltunen, A. Javey, "Tape-Free, Digital Wearable Band for Exercise Sweat Rate Monitoring", *Advanced Materials Technologies*, 2201187, 2023.
18. I. K. M. R. Rahman, S. Z. Uddin, H. Kim, N. Higashitarumizu, A. Javey, "Low voltage AC electroluminescence in silicon MOS capacitors", *Applied Physics Letters*, 121 (19), 193502, 2022.
19. B. Sari, H. Batiz, C. Zhao, A. Javey, D.C. Chrzan, M.C. Scott, "Structural heterogeneity in non-crystalline $\text{Te}_x\text{Se}_{1-x}$ thin films", *Applied Physics Letters*, 121, 012101, 2022.
20. S. Z. Uddin, N. Higashitarumizu, H. Kim, I.K.M.R. Rahman, A. Javey, "Efficiency Roll-Off Free Electroluminescence from Monolayer WSe_2 ", *Nano Letters*, 22, 5316–5321, 2022.
21. H. Batiz, J. Guo, G.H. Ahn, H. Kim, A. Javey, J.W. Ager III, D.C. Chrzan, "Theory of liquid-mediated strain release in two-dimensional materials", *Physical Review Materials*, 6 (5), 054005, 2022.
22. S.Z. Uddin, N. Higashitarumizu, H. Kim, J. Yi, X. Zhang, D. Chrzan, A. Javey, "Enhanced Neutral Exciton Diffusion in Monolayer WS_2 by Exciton-Exciton Annihilation", *ACS Nano*, 16 (5), 8005-8011, 2022.
23. M. Bariya, N. Davis, L. Gillan, E. Jansson, A. Kokkonen, C. McCaffrey, J. Hiltunen, A. Javey, "Resettable Microfluidics for Broad-Range and Prolonged Sweat Rate Sensing", *ACS Sensors*, 7 (4), 1156-1164, 2022.

24. C. Zhao, H. Batiz, B. Yasar, W. Ji, M.C. Scott, D.C. Chrzan, A. Javey, "Orientated Growth of Ultrathin Tellurium by van der Waals Epitaxy", *Advanced Materials Interfaces*, 9 (5), 2101540, 2022.
25. N. Gupta, H. Kim, N.S. Azar, S.Z. Uddin, D.-H. Lien, K.B. Crozier, A. Javey, "Bright Mid-Wave Infrared Resonant-Cavity Light-Emitting Diodes Based on Black Phosphorus", *Nano letters*, 22 (3), 1294-1301, 2022.
26. S.Z. Uddin, N. Higashitarumizu, H. Kim, E. Rabani, A. Javey, "Engineering Exciton Recombination Pathways in Bilayer WSe₂ for Bright Luminescence", *ACS Nano*, 16 (1), 1339-1345, 2022.
27. Y. Rho, H. Kim, A. Javey, C.P. Grigoropoulos, "Laser-Assisted Thermomechanical Thinning of MoTe₂ in Nanoscale Lateral Resolution", *Advanced Materials Interfaces*, 2200634, 2022.
28. H. Kim, S. Z. Uddin, D.-H. Lien, M. Yeh, N. S. Azar, S. Balendhran, T. Kim, N. Gupta, Y. Rho, C. P. Grigoropoulos, K. B. Crozier, A. Javey, "Actively variable spectrum optoelectronics with black phosphorus", *Nature*, 596, 232–237, 2021.
29. H. Kim, S. Z. Uddin, N. Higashitarumizu, E. Rabani, A. Javey, "Inhibited nonradiative decay at all exciton densities in monolayer semiconductors", *Science*, 373, 448, 2021.
30. K. Tang, K. Dong, J. Li, M. P. Gordon, F. G. Reichertz, H. Kim, Y. Rho, Q. Wang, C.-Y. Lin, C. P. Grigoropoulos, A. Javey, J. J. Urban, J. Yao, R. Levinson, J. Wu, "Temperature-adaptive radiative coating for all-season household thermal regulation", *Science*, 374, 1504–1509, 2021.
31. H. Y. Y. Nyein, M. Bariya, B. Tran, C. H. Ahn, B. J. Brown, W. Ji, N. Davis, A. Javey, "A wearable patch for continuous analysis of thermoregulatory sweat at rest", *Nature Communications*, 12, 1823, 2021.
32. V. Wang, A. Javey, "A Resonantly Driven, Electroluminescent Metal Oxide Semiconductor Capacitor with High Power Efficiency", *ACS Nano*, 15, 9, 15210–15217, 2021.
33. C. Zhao, H. Batiz, B. Yasar, H. Kim, W. Ji, M. C. Scott, D. C. Chrzan, A. Javey. "Tellurium Single-Crystal Arrays by Low-Temperature Evaporation and Crystallization", *Advanced Materials*, 33 (37), 2100860, 2021.
34. S. Balendhran, Z. Hussain, V. R. Shrestha, J. Cadusch, M. Ye, N. S. Azar, H. Kim, R. Ramanathan, J. Bullock, A. Javey, V. Bansal, K. B. Crozier, "Copper Tetracyanoquinodimethane (CuTCNQ): A Metal–Organic Semiconductor for Room-Temperature Visible to Long-Wave Infrared Photodetection", *ACS Applied Materials & Interfaces*, 13 (32), 38544-38552, 2021.
35. N. S. Azar, J. Bullock, S. Balendhran, H. Kim, A. Javey, K. B. Crozier, "Light–Matter Interaction Enhancement in Anisotropic 2D Black Phosphorus via Polarization-Tailoring Nano-Optics", *ACS Photonics*, 8, 1120-1128, 2021.

36. Y. Lin, M. Bariya, A. Javey, "Wearable Biosensors for Body Computing", *Advanced Functional Materials*, 31 (39), 2170290, 2021.
37. N. S. Azar, J. Bullock, V. R. Shrestha, S. Balendhran, W. Yan, H. Kim, A. Javey, K. B. Crozier, "Long-Wave Infrared Photodetectors Based on 2D Platinum Diselenide atop Optical Cavity Substrates", *ACS Nano*, 15, 6573-6581, 2021.
38. S. Z. Uddin, E. Rabani, A. Javey, "Universal Inverse Scaling of Exciton–Exciton Annihilation Coefficient with Exciton Lifetime", *Nano Letters*, 21, 1, 424–429, 2021.
39. V. Wang, Y. Zhao, A. Javey, "Performance Limits of an Alternating Current Electroluminescent Device", *Advanced Materials*, 33 (2), 2005635, 2021.
40. J. Zhao, H. Y. Y. Nyein, L. Hou, Y. Lin, M. Bariya, C. H. Ahn, W. Ji, Z. Fan, A. Javey, "A Wearable Nutrition Tracker", *Advanced Materials*, 33 (1), 2006444, 2021.
41. Y. Zhao, V. Wang, D.-H. Lien, A. Javey, "A generic electroluminescent device for emission from infrared to ultraviolet wavelengths", *Nature Electronics*, 3, 612–621, 2020.
42. L. Gu, S. Poddar, Y. Lin, Z. Long, D. Zhang, Q. Zhang, L. Shu, X. Qiu, M. Kam, A. Javey, Z. Fan, "A biomimetic eye with a hemispherical perovskite nanowire array retina", *Nature*, 581, 278–282, 2020.
43. C. Zhao, C. Tan, D.-H. Lien, X. Song, M. Amani, M. Hettick, H. Y. Y. Nyein, Z. Yuan, L. Li, M. C. Scott, A. Javey, "Evaporated tellurium thin films for p-type field-effect transistors and circuits", *Nature Nanotechnology*, 15, 53–58, 2020. (additional article in news & views)
44. M. Hettick, H. Li, D.-H. Lien, M. Yeh, T.-Y. Yang, M. Amani, N. Gupta, D. C. Chrzan, Y.-L. Chueh, A. Javey, "Shape-controlled single-crystal growth of InP at low temperatures down to 220 °C", *Proceedings of the National Academy of Sciences (PNAS)*, 117 (2) 902-906, 2020.
45. M. Bariya, L. Li, R. Ghattamaneni, C. H. Ahn, H. Y. Y. Nyein, L.-C. Tai, A. Javey, "Glove-based sensors for multimodal monitoring of natural sweat", *Science Advances*, 6, 35, eabb8308, 2020.
46. Y. Zhao, V. Wang, A. Javey, "Molecular Materials with Short Radiative Lifetime for High-Speed Light-Emitting Devices", *Matter*, 3 (6), 1832-1844, 2020.
47. S. Z. Uddin, H. Kim, M. Lorenzon, M. Yeh, D.-H. Lien, E. S. Barnard, H. Htoon, A. Weber-Bargioni, A. Javey, "Neutral Exciton Diffusion in Monolayer MoS₂", *ACS Nano*, 14, 13433–13440, 2020.
48. D. W. Gardner, Y. Xia, H. M. Fahad, A. Javey, C. Carraro, R. Maboudian, "Improved Hydrogen Sensitivity and Selectivity in PdO with Metal-Organic Framework Membrane", *Journal of the Electrochemical Society*, 167, 147503, 2020.

49. C. Tan, M. Amani, C. Zhao, M. Hettick, X. Song, D.-H. Lien, H. Li, M. Yeh, V. R. Shrestha, K. B. Crozier, M. C. Scott, A. Javey, "Evaporated $\text{Se}_x\text{Te}_{1-x}$ Thin Films with Tunable Bandgaps for Short-Wave Infrared Photodetectors", *Advanced Materials*, 32, 2001329, 2020.
50. H. Liu, X. Yu, K. Wu, Y. Gao, S. Tongay, A. Javey, L. Chen, J. Hong, J. Wu, "Extreme in-plane thermal conductivity anisotropy in titanium trisulfide caused by heat-carrying optical phonons", *Nano Letters*, 20, 5221–5227, 2020.
51. A. J. Goodman, D.-H. Lien, G. H. Ahn, L. L. Spiegel, M. Amani, A. P. Willard, A. Javey, W. A. Tisdale, "Substrate-Dependent Exciton Diffusion and Annihilation in Chemically Treated MoS_2 and WS_2 ", *The Journal of Physical Chemistry C*, 124, 12175–12184, 2020.
52. L.-C. Tai, C. H. Ahn, H. Y. Y. Nyein, W. Ji, M. Bariya, Y. Lin, L. Li, A. Javey, "Nicotine Monitoring with Wearable Sweat Band", *ACS Sensors*, 5, 1831–1837, 2020.
53. Z. Yuan, M. Bariya, H. M. Fahad, J. Wu, R. Han, N. Gupta, A. Javey, "Trace-Level, Multi-Gas Detection for Food Quality Assessment Based on Decorated Silicon Transistor Arrays", *Advanced Materials*, 1908385, 2020.
54. W. Ji, T. Allen, X. Yang, G. Zeng, S. De Wolf, A. Javey, "Polymeric Electron-Selective Contact for Crystalline Silicon Solar Cells with an Efficiency Exceeding 19%", *ACS Energy Letters*, 5, 897-902, 2020.
55. J. Cho, M. Amani, D.-H. Lien, H. Kim, M. Yeh, V. Wang, C. Tan, A. Javey, "Centimeter-Scale and Visible Wavelength Monolayer Light-Emitting Devices", *Advanced Functional Materials*, 1907941, 2019.
56. Y. Yu, H. Y. Y. Nyein, W. Gao, A. Javey, "Flexible Electrochemical Bioelectronics: The Rise of In Situ Bioanalysis", *Advanced Materials*, 1902083, 2019.
57. J. Sun, A. Sapkota, H. Park, P. Wesley, Y. Jung, B. B. Maskey, Y. Kim, Y. Majima, J. Ding, J. Ouyang, C. Guo, J. Lefebvre, Z. Li, P. R. L. Malenfant, A. Javey, G. Cho, "Fully R2R-Printed Carbon-Nanotube-Based Limitless Length of Flexible Active-Matrix for Electrophoretic Display Application", *Advanced Electronic Materials*, 6(4), 1901431, 2020.
58. H. Liu, C. Yang, B. Wei, L. Jin, A. Alatas, A. Said, S. Tongay, F. Yang, A. Javey, J. Hong, J. Wu, "Anomalously Suppressed Thermal Conduction by Electron-Phonon Coupling in Charge-Density-Wave Tantalum Disulfide", *Advanced Science*, 1902071, 2020.
59. C. Zhao, L. Hurtado, A. Javey, "Thermal stability for Te-based devices", *Appl. Phys. Lett.* 117, 192104, 2020.
60. V. R. Shrestha, B. Craig, J. Meng, J. Bullock, A. Javey, K. B. Crozier, "Mid-to long-wave infrared computational spectroscopy with a graphene metasurface modulator", *Scientific Reports*, 10, 5377, 2020.

61. H. Taz, B. Prasad, Y.-L. Huang, Z. Chen, S.-L. Hsu, R. Xu, V. Thakare, T. S. Sakhivel, C. Liu, M. Hettick, R. Mukherjee, S. Seal, L. W. Martin, A. Javey, G. Duscher, R. Ramesh, R. Kalyanaraman, "Integration of amorphous ferromagnetic oxides with multiferroic materials for room temperature magnetoelectric spintronics", *Scientific Reports*, 10, 3583, 2020.
62. H. Zhao, Y. Zhao, Y. Song, M. Zhou, W. Lv, L. Tao, Y. Feng, B. Song, Y. Ma, J. Zhang, J. Xiao, Y. Wang, D.-H. Lien, M. Amani, H. Kim, X. Chen, Z. Wu, Z. Ni, P. Wang, Y. Shi, H. Ma, X. Zhang, J.-B. Xu, A. Troisi, A. Javey, X. Wang, "Strong optical response and light emission from a monolayer molecular crystal", *Nature Communications*, 10, 5589, 2019.
63. S. B. Desai, H. M. Fahad, T. Lundberg, G. Pitner, H. Kim, D. Chrzan, H.-S. P. Wong, A. Javey, "Gate Quantum Capacitance Effects in Nanoscale Transistors", *Nano Letters*, 19, 7130-7137, 2019.
64. P. Zhao, R. Wang, D.-H. Lien, Y. Zhao, H. Kim, J. Cho, G. H. Ahn, A. Javey, "Scanning Probe Lithography Patterning of Monolayer Semiconductors and Its Application for Quantifying Edge Recombination", *Advanced Materials*, 31, 1900136, 2019.
65. H. Y. Y. Nyein, M. Bariya, L. Kivimäki, S. Uusitalo, T. S. Liaw, Elina Jansson, C. H. Ahn, J. A. Hangasky, J. Zhao, Y. Lin, T. Happonen, M. Chao, C. Liedert, Y. Zhao, L.-C. Tai, J. Hiltunen, A. Javey, "Regional and Correlative Sweat Analysis Using High-throughput Microfluidic Sensing Patches Towards Decoding Sweat", *Science Advances*, 5 (8), eaaw9906, 2019.
66. T. Allen, J. Bullock, X. Yang, A. Javey, S. De Wolf, "Passivating contacts unlock the full potential of silicon solar cells", *Nature Energy*, 4, 914–928, 2019.
67. Z. Yuan, L. Hou, M. Bariya, H. Y. Y. Nyein, L.-C. Tai, W. Ji, L. Li, A. Javey, "A Multi-Modal Sweat Sensing Patch for Cross-Verification of Sweat Rate, Total Ionic Charge, and Na⁺ Concentration", *Lab on a Chip*, 19, 3179 - 3189, 2019.
68. L.-C. Tai, T. S. Liaw, Y. Lin, H. Y. Y. Nyein, M. Bariya, W. Ji, M. Hettick, C. Zhao, J. Zhao, L. Hou, Z. Yuan, Z. Fan, A. Javey, "A Wearable Sweat Band for Noninvasive Levodopa Monitoring", *Nano Letters*, 19, 6346-6351, 2019.
69. D.-H. Lien, S. Z. Uddin, M. Yeh, M. Amani, H. Kim, J. W. Ager III, E. Yablonovitch, and A. Javey, "Electrical suppression of all nonradiative recombination pathways in monolayer semiconductors", *Science*, 364, 468–471, 2019.
70. H. Kim, G. H. Ahn, J. Cho, M. Amani, J. P. Mastandrea, C. K. Groschner, D.-H. Lien, Y. Zhao, J. W. Ager III, M. C. Scott, D. C. Chrzan, A. Javey, "Synthetic WSe₂ monolayers with high photoluminescence quantum yield", *Science Advances*, 5, eaau4728, 2019.
71. Y. Yu, H. Y. Y. Nyein, W. Gao, A. Javey, "Flexible Electrochemical Bioelectronics: The Rise of In Situ Bioanalysis", *Advanced Materials*, 1902083, 2019.

72. W. Ji, Y. Zhao, H. M. Fahad, J. Bullock, T. Allen, D.-H. Lien, S. De Wolf, A. Javey, "Dip Coating Passivation of Crystalline Silicon by Lewis Acids", *ACS Nano*, 13, 3723–3729, 2019.
73. N. Gupta, H. M. Fahad, M. Amani, X. Song, M. Scott, A. Javey, "Elimination of Response to Relative Humidity Changes in Chemical-Sensitive Field Effect Transistors", *ACS Sensors*, 4, 1857-1863, 2019.
74. J. Bullock, Y. Wan, M. Hettick, X. Zhaoran, S. P. Phang, D. Yan, H. Wang, W. Ji, C. Samundsett, Z. Hameiri, D. Macdonald, A. Cuevas, A. Javey, "Dopant-Free Partial Rear Contacts Enabling 23% Silicon Solar Cells", *Advanced Energy Materials*, 1803367, 2019.
75. J. Zhao, Y. Lin, J. Wu, H. Y. Y. Nyein, M. Bariya, L.-C. Tai, M. Chao, W. Ji, G. Zhang, Z. Fan, A. Javey, "A Fully Integrated and Self-Powered Smartwatch for Continuous Sweat Glucose Monitoring", *ACS Sensors*, 4, 1925-1933, 2019.
76. Y. Lin, M. Bariya, H. Y. Y. Nyein, L. Kivimäki, S. Uusitalo, E. Jansson, W. Ji, Z. Yuan, T. Happonen, C. Liedert, J. Hiltunen, Z. Fan, A. Javey, "Porous Enzymatic Membrane for Nanotextured Glucose Sweat Sensors with High Stability toward Reliable Noninvasive Health Monitoring", *Advanced Functional Materials*, 29, 1902521, 2019.
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Patents

1. Nanoparticles with controlled growth, Ali Javey and Hongjie Dai, US Patent: US7655272 B1
2. Surface and gas phase doping of III-V semiconductors, Ali Javey, Alexandra C. Ford, Johnny C. Ho, US Patent: US8697467 B2
3. Semiconductor on insulator (XOI) for high performance field effect transistors, Ali Javey, Hyunhyub Ko, Kuniharu Takei. US Patent: US8525228 B2
4. Compact ion accelerator source, Thomas Schenkel, Arun Persaud, Rehan Kapadia, Ali Javey, US Patent: US8709350 B2
5. Black Ge based on crystalline/amorphous core/shell nanoneedle arrays, Ali Javey, Yu-Lun Chueh, Zhiyong Fan. US Patent: US8664095 B2
6. Nanostructure, Photovoltaic Device, and Method of Fabrication Thereof, Zhiyong Fan, Ali Javey, US Patent Application: US20120192934 A1
7. MORPHOLOGICAL AND SPATIAL CONTROL OF InP CRYSTAL GROWTH USING CLOSED-SPACED SUBLIMATION, Daisuke Kiriya, Maxwell Zheng, Ali Javey. US Patent Application: US20140069499 A1
8. High optical quality polycrystalline indium phosphide grown on metal substrates by MOCVD, Maxwell Zheng, Ali Javey. US Patent Application: US20140060646 A1
9. Compact ion source neutron generator, Thomas Schenkel, Arun Persaud, Rehan Kapadia, Ali Javey, Constance Chang-Hasnain, Ivo Rangelow, Joe Kwan. US Patent Application: US20130044846 A1
10. Methods of establishing low-resistance electrical contact to carbon nanostructures with graphitic interfacial layer, Yang CHAI, Arash Hazeghi, Kuniharu Takei, Ali Javey, H.S. Philip Wong. US Patent Application: US20130059134 A1
11. Carbon nanotube network thin-film transistors on flexible/stretchable substrates, Kuniharu Takei, Toshitake Takahashi, Ali Javey, US Patent Application: US20140124737 A1

Research Highlights

The core of Javey's research program is materials innovation for enabling new device structures and concepts. The lab studies a wide range of electronic materials in both planar and 3D geometries. In all cases, the lab explores new schemes of manipulating, processing, and engineering materials - often at unprecedented levels - to enable new functionalities and properties. Below are some research highlights.

1. Developed a new doping technology named monolayer doping (MLD) that utilizes surface chemistry to form self-assembled monolayers of dopant containing species on semiconductor surfaces followed by a subsequent diffusion by a thermal annealing (*Nature Materials*, 2008). The process has yielded some of the shallowest junctions reported to date, down to ~3 nm in thickness. The technology has been transferred to the semiconductor industry for further internal R&D, and is seen as a promising approach for S/D contact extensions for future nanoscale transistors.
2. Developed the ultrathin body III-V on insulator (XOI) device concept as a platform for integrating high mobility III-V semiconductors on Si for low power electronics (*Nature*, 2010). Reported p- and n-type III-V FETs with some of the highest mobilities reported to-date on a Si substrate with a subthreshold swing as low as ~70 mV/decade, approaching the ideal limit of MOSFETs.
3. Discovered the quantum unit of absorptance in 2D semiconductors (in collaboration with E. Yablonovitch; *PNAS*, 2013).
4. Developed a new growth mode for III-V *thin films* using the vapor-liquid-solid (VLS) technique (*Scientific Reports*, 2013). As a proof of concept, InP thin films (on the order of 1 μ m in thickness) are grown on non-epitaxial substrates (e.g., metal foils) using the thin-film VLS process with an ultralarge grain size of up to ~ 1mm and optoelectronic properties (including luminescence yield) approaching those of epitaxially grown layers. The work presents a promising route for low-cost growth of high quality III-V semiconductors for PV applications and beyond.
5. Developed process techniques for uniform assembly of nanostructured materials (e.g., nanowires and nanotubes) over large areas for system integration – moving beyond individual device work (*Nature Materials*, 2013; *Nature Materials*, 2010). As proof of concept, Javey's lab has demonstrated large-area monolithic integration of nanotube TFTs, pressure sensors, and OLEDs on a plastic substrate that can map pressure and provide instantaneous visual response through the integrated OLED display. The work presents a platform for 3-D integration of different material/device components for paper-thin smart/interactive surfaces and is an elegant example of systems enabled by nanomanufacturing.
6. Performed many of the initial experiments on carbon nanotube electronics that have become the cornerstone of the more broadly defined field of carbon electronics. Among the first demonstrations include ballistic transport in nanotube transistors (*Nature*, 2003; *Nano Letters*, 2004), ohmic metal contacts (*Nature*, 2003), high-k gate dielectric integration (*Nature Materials*, 2002), characterization of the mean free paths for acoustic and optical phonons (*PRL*, 2004). These advancements led to the first experimental demonstration of chemically synthesized nanostructures outperforming state-of-the-art Si transistors (*Nano Letters*, 2004).

Leadership Highlights

- ❖ **Co-Director of Bay Area PV Consortium (2011-2018):** Javey co-led (along with Yi Cui of Stanford) the Bay Area Photovoltaic Consortium (BAPVC). The consortium was established in 2011 by a \$30 million funding from U.S. Department of Energy (DOE) to help advance the U.S. PV manufacturing industry. The consortium consisted of ~35 co-PIs from 18 different institutions. BAPVC was a unique partnership joining universities and industry with the mission of developing advanced technologies to deliver high-performance photovoltaic modules at low-cost. BAPVC brought a revolutionary approach to creating the environment needed to promote innovation. While setting the scope for university research in topics with explicit industry support assures relevance of results, the consortium's premise was that it is the interaction among the leading scientists from both industry and universities that will catalyze generation of the disruptive ideas that can change the face of PV manufacturing.
- ❖ **Program Leader of Electronic Materials (E-Mat) at LBNL (2011-present).** Javey has been leading E-Mat since Fall 2010. E-MAT is a DOE core program, consisting of 6 co-PIs. The goal of the E-Mat program is to advance and expand the fundamental understanding of semiconductor materials science. The research focuses on the relationships between synthesis and processing conditions and the structure, properties, and stability of semiconductor materials systems. Progress in these areas is essential for the performance and reliability of several technologies, including solar power conversion devices, solid state sources of visible light, visual displays, and a large variety of sensors and power control systems for energy generation, conservation, distribution and use.

Teaching:

1. Instructor in undergraduate/graduate courses

- EE130/EE230M (Integrated-Circuit Devices) – undergraduate/graduate level
- EE143 (Microfabrication Technology) – undergraduate level
- EE290C (Advanced Topics in Nanoelectronics) – graduate level

- ❖ Javey was the recipient of the UC Berkeley Electrical Engineering Outstanding Teaching Award in 2012. Javey has been consistently rated by the students as one of the best instructors in EECS.

- ❖ Teaching evaluations:
<https://hkn.eecs.berkeley.edu/coursesurveys/instructor/7251>