

CURRICULUM VITAE
Ali Javey, Ph.D.

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Date of Birth: December 3, 1980

Academic Appointments

2015- present	<i>Conexant Systems Distinguished Professor</i> Electrical Engineering and Computer Sciences University of California at Berkeley
2014- present	<i>Professor</i> Electrical Engineering and Computer Sciences University of California at Berkeley
2010- 2014	<i>Associate Professor</i> Electrical Engineering and Computer Sciences University of California at Berkeley
2006 - 2010	<i>Assistant Professor</i> Electrical Engineering and Computer Sciences University of California at Berkeley (2005-2006, on leave)
2006 - present	<i>Faculty Principal Investigator</i> Materials Sciences Division Lawrence Berkeley National Laboratory
2011- present	<i>Program Leader</i> Electronic Materials Lawrence Berkeley National Laboratory
2011- present	<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.
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

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

2016 *Bakar Fellow (UC Berkeley)*
2015 *MRS Outstanding Young Investigator Award*
2014 *Nano Letters Young Investigator Lectureship*
2014 *Blavatnik National Award for Young Scientists Finalist*
2012 *UC Berkeley Electrical Engineering Outstanding Teaching Award*
2011 *APEC Science Prize for Innovation, Research and Education*
2011 *Netexplorateur of the Year Award*
2010 *IEEE Nanotechnology Early Career Award*
2010 *Alfred P. Sloan Research Fellow*
2010 *Mohr Davidow Ventures (MDV) Innovator Award*
2009 *MIT Technology Review TR35*
2009 *National Academy of Sciences Award for Initiatives in Research*
2008 *National Science Foundation CAREER Award*
2008 *U.S. Frontiers of Engineering, National Academy of Engineering*
2004 *Election to Harvard Society of Fellows, Junior Fellow*
2004 *MRS Graduate Student Gold Award*
2003-2005 *Semiconductor Research Corporation Peter Verhofstadt Fellowship*
2001 *Hampton Roads Section of the American Chemical Society (ACS)
Award to the Outstanding Graduating Senior in Chemistry*
1998-2001 *Tidewater Builders Association Scholarship*

Journal Editorial Boards:

- Associate Editor – *ACS Nano*
- Editorial Board – *Nano Research*
- Editorial Board – *Scientific Reports*
- Advisory Board - *NPG Asia Materials*

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: (>29,000 citations, h-index= 78; Google Scholar, 10/2017)

1. J. H. Park, A. Sanne, Y. Guo, M. Amani, K. Zhang, H. C.P. Movva, J. A. Robinson, A. Javey, J. Robertson, S. K. Banerjee, A. C. Kummel, "Defect Passivation of Transition Metal Dichalcogenides via a Charge Transferred Van der Waals Interface" *Science Advances*, 2017, in press.
2. Gurudayal, J. Bullock, D. F. Srankó, C. M. Towle, Y. Lum, M. Hettick, A. Javey, J. Ager, "Efficient solar-driven electrochemical CO₂ reduction to hydrocarbons and oxygenates", *Energy & Environmental Science*, 10, 2222-2230, 2017.
3. G. H. Ahn, M. Amani, H. Rasool, D.-H. Lien, J. P. Mastandrea, J. W. Ager, M. Dubey, D. C. Chrzan, A. M. Minor, A. Javey. "Strain-engineered growth of two-dimensional materials", *Nature Communications*, 8, 608, 2017.
4. N. Grant, T. Niewelt, N. Wilson, E. Wheeler-Jones, J. Bullock, M. Al-Amin, M. Schubert, A. van Veen, A. Javey, J. Murphy, "Superacid-Treated Silicon Surfaces: Extending the Limit of Carrier Lifetime for Photovoltaic Applications", *IEEE Journal of Photovoltaics*, 2017, in press.
5. J. Bullock, H. Ota, H. Wang, Z. Xu, M. Hettick, D. Yan, C. Samundsett, Y. Wan, S. Essig, M. Morales-Masis, A. Cuevas, A. Javey. "Microchannel contacting of crystalline silicon solar cells", *Scientific Reports*, 7, 9085, 2017.
6. P. Zhao, M. Amani, D.-H. Lien, G. H. Ahn, D. Kiriya, J. P. Mastandrea, J. W. Ager III, E. Yablonovitch, D. C. Chrzan, A. Javey, "Measuring the Edge Recombination Velocity of Monolayer Semiconductors", *Nano Letters*, 17, 5356–5360, 2017.
7. Y. Gao, H. Ota, E. W. Schaler, K. Chen, A. Zhao, W. Gao, H. M. Fahad, Y. Leng, A. Zheng, F. Xiong, C. Zhang, L.-C. Tai, P. Zhao, R. S. Fearing, A. Javey. "Wearable Microfluidic Diaphragm Pressure Sensor for Health and Tactile Touch Monitoring", *Advanced Materials*, 1701985, 2017.
8. H. Ota, M. Chao, Y. Gao, E. Wu, L.-C. Tai, K. Chen, Y. Matsuoka, K. Iwai, H. M. Fahad, W. Gao, H. Y. Y. Nyein, L. Lin, A. Javey. "3D Printed Earable Smart Devices for Real-time Detection of Core Body Temperature", *ACS Sensors*, 2 (7), 990–997, 2017.
9. P. Taheri, H. M. Fahad, M. Tosun, M. Hettick, D. Kiriya, K. Chen, A. Javey, "Nanoscale Junction Formation by Gas-Phase Monolayer Doping", *ACS Applied Materials & Interfaces*, 9 (24), 20648-20655, 2017.

10. H. Kim, D.-H. Lien, M. Amani, J. W. Ager, A. Javey, "Highly Stable Near-Unity Photoluminescence Yield in Monolayer MoS₂ by Fluoropolymer Encapsulation and Superacid Treatment", *ACS Nano*, 11 (5), 5179-5185, 2017.
11. W. S. Drisdell, L. Leppert, C. M. Sutter-Fella, Y. Liang, Y. Li, Q. P. Ngo, L. F. Wan, S. Gul, T. Kroll, D. Sokaras, A. Javey, J. Yano, J. B. Neaton, F. M. Toma, D. Prendergast, I. D. Sharp, "Determining Atomic-Scale Structure and Composition of Organo-Lead Halide Perovskites by Combining High-Resolution X-ray Absorption Spectroscopy and First-Principles Calculations", *ACS Energy Letters*, 2 (5), 1183-1189, 2017.
12. S. Emaminejad, W. Gao, E. Wu, Z. A. Davies, H. Y. Y. Nyein, S. Challa, S. P. Ryan, H. M. Fahad, K. Chen, Z. Shahpar, S. Talebi, C. Milla, A. Javey, R. W. Davis. "Autonomous sweat extraction and analysis applied to cystic fibrosis and glucose monitoring using a fully integrated wearable platform", *Proceedings of the National Academy of Sciences*, 114, 4625-4630, 2017.
13. H. M. Fahad, H. Shiraki, M. Amani, C. Zhang, V. S. Hebbar, W. Gao, H. Ota, M. Hettick, D. Kiriya, Y.-Z. Chen, Y.-L. Chueh, A. Javey. "Room temperature multiplexed gas sensing using chemical sensitive 3.5 nm thin silicon transistors", *Science Advances*, 3, e1602557, 2017.
14. H. Ko, A. Javey. "Smart Actuators and Adhesives for Reconfigurable Matter", *Accounts of Chemical Research*, 50 (4), 691-702, 2017.
15. Y. Wan, C. Samundsett, J. Bullock, M. Hettick, T. Allen, D. Yan, J. Peng, Y. Wu, J. Cui, A. Javey, A. Cuevas. "Conductive and Stable Magnesium Oxide Electron-Selective Contacts for Efficient Silicon Solar Cells", *Advanced Energy Materials*, 7, 1601863, 2017.
16. C. M. Sutter-Fella, D. W. Miller, Q. P. Ngo, E. T. Roe, F. M. Toma, I. D. Sharp, M. C. Lonergan, A. Javey. "Band Tailing and Deep Defect States in CH₃NH₃Pb (1-x)Br_x)₃ Perovskites as Revealed by Sub-Bandgap Photocurrent", *ACS Energy Letters*, 2 (3), 709-715, 2017.
17. T.-Y. Kim, Y. Song, K. Cho, M. Amani, G. H. Ahn, J.-K. Kim, J. Pak, S. Chung, A. Javey, T. Lee, "Analysis of the interface characteristics of CVD-grown monolayer MoS₂ by noise measurements", *Nanotechnology*, 28 (14), 145702, 2017.
18. H. Medina, J.-G. Li, T.-Y. Su, Y.-W. Lan, S.-H. Lee, C.-W. Chen, Y.-Z. Chen, A. Manikandan, S.-H. Tsai, A. Navabi, X. Zhu, Y.-C. Shih, W.-S. Lin, J.-H. Yang, S. R. Thomas, B.-W. Wu, C.-H. Shen, J.-M. Shieh, H.-N. Lin, A. Javey, K. L. Wang, and Y.-L. Chueh. "Wafer-Scale Growth of WSe₂ Monolayers Toward Phase-Engineered Hybrid WO_x/WSe₂ Films with Sub-ppb NO_x Gas Sensing by a Low-Temperature Plasma-Assisted Selenization Process", *Chemistry of Materials*, 29 (4), 1587-1598, 2017.
19. T. G. Allen, J. Bullock, Q. Jeangros, C. Samundsett, Y. Wan, J. Cui, A. Hessler-Wyser, S. De Wolf, A. Javey, A. Cuevas. "A Low Resistance Calcium/Reduced Titania Passivated Contact for High Efficiency Crystalline Silicon Solar Cells", *Advanced Energy Materials*, 1602606, 2017.

20. T. G. Allen, J. Bullock, P. Zheng, B. Vaughan, M. Barr, Y. Wan, C. Samundsett, A. Javey, A. Cuevas, "Calcium contacts to n-type crystalline silicon solar cells", *Progress in Photovoltaics: Research and Applications*, 25, 636-644, 2017.
21. W. Gao, H. Y. Y. Nyein, Z. Shahpar, L.-C. Tai, E. Wu, M. Bariya, H. Ota, H. M. Fahad, K. Chen, A. Javey. "Wearable Sweat Biosensors", *IEEE IEDM Technical Digest*, 6.6.1-6.6.2, 2016.
22. S. B. Desai, S. R. Madhvapathy, A. B. Sachid, J. P. Llinas, Q. Wang, G. H. Ahn, G. Pitner, M. J. Kim, J. Bokor, C. Hu, H.-S. P. Wong, A. Javey, "MoS₂ transistors with 1-nanometer gate lengths", *Science*, 354, 99-102, 2016.
23. Z. Lin, A. McCreary, N. Briggs, S. Subramanian, K. Zhang, Y. Sun, X. Li, N. J. Borys, H. Yuan, S. K. Fullerton-Shirey, A. Chernikov, H. Zhao, S. McDonnell, A. M. Lindenberg, K. Xiao, B. J. LeRoy, M. Drndić, J. C.M. Hwang, J. Park, M. Chhowalla, R. E. Schaak, A. Javey, M. C. Hersam, J. Robinson, M. Terrones. "2D materials advances: from large scale synthesis and controlled heterostructures to improved characterization techniques, defects and applications", *2D Materials*, 3, 042001, 2016.
24. J. Pak, M. Min, K. Cho, D.-H. Lien, G. H. Ahn, J. Jang, D. Yoo, S. Chung, A. Javey, and T. Lee, "Improved photoswitching response times of MoS₂ field-effect transistors by stacking p-type copper phthalocyanine layer", *Appl. Phys. Lett.*, 109, 183502, 2016.
25. Y. Song, H. Jeong, S. Chung, G. H. Ahn, T.-Y. Kim, J. Jang, D. Yoo, H. Jeong, A. Javey, T. Lee, "Origin of multi-level switching and telegraphic noise in organic nanocomposite memory devices", *Scientific Reports*, 6, 33967, 2016. (doi:10.1038/srep33967)
26. J. Bullock, D. Kiriya, N. E Grant, A. Azcatl, M. Hettick, T. Kho, P. Phang, H. C. Sio, D. Yan, D. MacDonald, M. A. Quevedo-Lopez, R. M. Wallace, A. Cuevas, A. Javey. "Superacid passivation of crystalline silicon surfaces", *ACS Applied Materials & Interfaces*, 8, 24205–24211, 2016.
27. H. Y. Y. Nyein, W. Gao, Z. Shahpar, S. Emaminejad, S. Challa, K. Chen, H. M. Fahad, L.-C. Tai, H. Ota, R. W. Davis, A. Javey. "A Wearable Electrochemical Platform for Non-Invasive Simultaneous Monitoring of Ca²⁺ and pH", *ACS Nano*, 10, 7216–7224, 2016.
28. Y. Li, J. K. Cooper, W. Liu, C. M. Sutter-Fella, M. Amani, J. W. Beeman, A. Javey, J. W. Ager, Y. Liu, F. M. Toma, I. D. Sharp. "Defective TiO₂ with high photoconductive gain for efficient and stable planar heterojunction perovskite solar cells", *Nature Communications*, 7, 12446, 2016.
29. H. Y. Y. Nyein, W. Gao, Z. Shahpar, S. Emaminejad, S. Challa, K. Chen, H. M. Fahad, L.-C. Tai, H. Ota, R. W. Davis, A. Javey. "A Wearable Electrochemical Platform for Non-Invasive Simultaneous Monitoring of Ca²⁺ and pH", *ACS Nano*, 10, 7216–7224, 2016.

30. M. Amani, R. A. Burke, X. Ji, P. Zhao, D.-H. Lien, P. Taheri, G. H. Ahn, D. Kiriya, J. W. Ager III, E. Yablonovitch, J. Kong, M. Dubey, A. Javey. "High Luminescence Efficiency in MoS₂ Grown by Chemical Vapor Deposition", *ACS Nano*, 10, 6535–6541, 2016.
31. D. Kiriya, P. Lobaccaro, H. Nyein, P. Taheri, M. Hettick, H. Shiraki, C. M. Sutter-Fella, P. Zhao, W. Gao, R. Maboudian, J. Ager, A. Javey. "General Thermal Texturization Process of MoS₂ for Efficient Electrocatalytic Hydrogen Evolution Reaction", *Nano Letters*, 16, 4047–4053, 2016.
32. M. Tosun, L. Chan, M. Amani, T. Roy, G. H. Ahn, P. Taheri, C. Carraro, J. Ager, R. Maboudian, A. Javey. "Air Stable n-Doping of WSe₂ by Anion Vacancy Formation with Mild Plasma Treatment", *ACS Nano*, 10, 6853–6860, 2016.
33. H.-P. Wang, C. M. Sutter-Fella, P. Lobaccaro, M. Hettick, M. Zheng, D.-H. Lien, D. W. Miller, C. W. Warren, E. T. Roe, M. C. Lonergan, H. L. Guthrey, N. M. Haegel, J. W. Ager, C. Carraro, R. Maboudian, J.-H. He, A. Javey, "Increased Optoelectronic Quality and Uniformity of Hydrogenated p-InP Thin Films", *Chemistry of Materials*, 28, 4602–4607, 2016.
34. J. Bullock, P. Zheng, Q. Jeangros, M. Tosun, M. Hettick, C. M. Sutter-Fella, Y. Wan, T. Allen, D. Yan, D. Macdonald, S. De Wolf, A. Hessler-Wyser, A. Cuevas, A. Javey, "Lithium Fluoride Based Electron Contacts for High Efficiency n-type Crystalline Silicon Solar Cells", *Advanced Energy Materials*, 1600241, 2016.
35. Y. Wan, C. Samundsett, J. Bullock, T. Allen, M. Hettick, D. Yan, P. Zheng, X. Zhang, J. Cui, J. A. McKeon, A. Javey, A. Cuevas. "Magnesium fluoride electron-selective contacts for crystalline silicon solar cells", *ACS Applied Materials & Interfaces*, 8, 14671–14677, 2016.
36. W. Gao, H. Y. Y. Nyein, Z. Shahpar, H. M. Fahad, K. Chen, S. Emaminejad, Y. Gao, L.-C. Tai, H. Ota, E. Wu, J. Bullock, Y. Zeng, D.-H. Lien, A. Javey, "Wearable Microsensor Array for Multiplexed Heavy Metal Monitoring of Body Fluids", *ACS Sensors*, 1, 866–874, 2016. (ACS Editors' Choice; Cover Article)
37. M. Amani, P. Taheri, R. Addou, G. H. Ahn, D. Kiriya, D.-H. Lien, J. W. Ager III, R. M. Wallace, A. Javey. "Recombination Kinetics and Effects of Superacid Treatment in Sulfur- and Selenium-Based Transition Metal Dichalcogenides", *Nano Letters*, 16 (4), 2786–2791, 2016.
38. W. Gao, S. Emaminejad, H. Y. Y. Nyein, S. Challa, K. Chen, A. Peck, H. M. Fahad, H. Ota, H. Shiraki, D. Kiriya, D.-H. Lien, G. A. Brooks, R. W. Davis, A. Javey. "Fully-integrated wearable sensor arrays for multiplexed in-situ perspiration analysis", *Nature*, 529, 509–514, 2016.
39. J. Bullock, M. Hettick, J. Geissbühler, A. J. Ong, T. Allen, C. M. Sutter-Fella, T. Chen, H. Ota, E. W. Schaler, S. De Wolf, C. Ballif, A. Cuevas, A. Javey, "Efficient silicon solar cells with dopant-free asymmetric heterocontacts", *Nature Energy*, 15031, 2016.
40. K. Chen, R. Kapadia, A. Harker, S. Desai, J. S. Kang, S. Chuang, M. Tosun, C. M. Sutter-Fella, M. Tsang, Y. Zeng, D. Kiriya, J. Hazra, S. R. Madhupathy, M.

- Hettick, Y.-Z. Chen, J. Mastandrea, M. Amani, S. Cabrini, Y.-L. Chueh, J. W. Ager III, D. C. Chrzan, A. Javey. "Direct growth of single crystalline III-V semiconductors on amorphous substrates", *Nature Communications*, 7, 10502, 2016.
41. S. B. Desai, S. R. Madhupathy, M. Amani, D. Kiriya, M. Hettick, M. Tosun, Y. Zhou, M. Dubey, J. W. Ager, D. Chrzan, A. Javey. "Gold mediated exfoliation of ultra-large optoelectronically perfect monolayers", *Advanced Materials*, 28, 4053-4058, 2016.
 42. T. Roy, M. Tosun, M. Hettick, G. H. Ahn, C. Hu, and A. Javey. "2D-2D tunneling field-effect transistors using WSe₂/SnSe₂ heterostructures", *Applied Physics Letters*, 108, 083111, 2016.
 43. X. Xu, J. Bullock, L. T. Schelhas, E. Z. Stutz, J. J. Fonseca, M. Hettick, V. L. Pool, K. F. Tai, M. F. Toney, X. Fang, A. Javey, L. H. Wong, and J. W. Ager. "Chemical Bath Deposition of p-Type Transparent, Highly Conducting (CuS)_x:(ZnS)_{1-x} Nanocomposite Thin Films and Fabrication of Si Heterojunction Solar Cells", *Nano Letters*, 16 (3), 1925-1932, 2016.
 44. Y. Zhou, D. Kiriya, E. E. Haller, J. W. Ager III, A. Javey, D. C. Chrzan. "Compliant substrate epitaxy: Au on MoS₂", *Physical Review B*, 93, 054106, 2016.
 45. C. M. Sutter-Fella, Y. Li, M. Amani, J. Ager, F. Toma, E. Yablonovitch, I. Sharp, A. Javey. "High Photoluminescence Quantum Yield in Band Gap Tunable Bromide Containing Mixed Halide Perovskites", *Nano Letters*, 16 (1), 800–806, 2016.
 46. H. Ota, S. Emaminejad, Y. Gao, A. Zhao, E. Wu, S. Challa, K. Chen, H. M. Fahad, A. K. Jha, D. Kiriya, W. Gao, H. Shiraki, K. Morioka, A. R. Ferguson, K. E. Healy, R. W. Davis, A. Javey. "Application of 3D printing for smart objects with embedded electronic sensors and systems", *Advanced Materials Technologies*, 1 (1), 1600013, 2016. (cover article)
 47. T.-Y. Kim, M. Amani, G. H. Ahn, Y. Song, A. Javey, S. Chung, T. Lee, "Electrical Properties of Synthesized Large-Area MoS₂ Field-Effect Transistors Fabricated with Inkjet-Printed Contacts", *ACS Nano*, 10, 2819, 2016.
 48. A. B. Sachid, M. Tosun, S. B. Desai, C.-Y. Hsu, D.-H. Lien, S. R. Madhupathy, Y.-Z. Chen, M. Hettick, J. S. Kang, Y. Zeng, J.-H. He, E. Y. Chang, Y.-L. Chueh, A. Javey, C. Hu, "Monolithic 3D CMOS using Layered Semiconductors", *Advanced Materials*, 28, 2547–2554, 2016.
 49. K. Chen, W. Gao, S. Emaminejad, D. Kiriya, H. Ota, H. Y. Y. Nyein, K. Takei, A. Javey, "Printed Carbon Nanotube Electronics and Sensor Systems", *Advanced Materials*, 28 (22), 4397-4414, 2016. (frontpiece article)
 50. M. Zheng, K. Horowitz, M. Woodhouse, C. Battaglia, R. Kapadia, A. Javey. "III-Vs at scale: a PV manufacturing cost analysis of the thin film vapor-liquid-solid growth mode", *Progress in Photovoltaics: Research and Applications*, 24, 871–878, 2016.
 51. M. Amani, D.-H. Lien, D. Kiriya, J. Xiao, A. Azcatl, J. Noh, S. R. Madhupathy, R. Addou, S. K. C., M. Dubey, K. Cho, R. M. Wallace, S.-C. Lee, J.-H. He, J. W. Ager

- III, X. Zhang, E. Yablonovitch, A. Javey, "Near-Unity Photoluminescence Quantum Yield in MoS₂", *Science*, 350, 1065-1068, 2015.
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53. P. Zhao, S. Desai, M. Tosun, T. Roy, H. Fang, A. Sachid, M. Amani, C. Hu, A. Javey, "2D Layered Materials: From Materials Properties to Device Applications", *IEEE IEDM Technical Digest*, 27.3.1 - 27.3.4, 2015.
54. M. Jaquez, K. M. Yu, M. Ting, M. Hettick, J. F. Sánchez-Royo, M. Wełna, A. Javey, O. D. Dubon, W. Walukiewicz. "Growth and characterization of ZnO_{1-x}S_x highly mismatched alloys over the entire composition", *Journal of Applied Physics*, 118, 215702, 2015.
55. W. Lee, H. Koo, J. Sun, J. Noh, K.-S. Kwon, C. Yeom, Y. Choi, K. Chen, A. Javey, G. Cho. "A fully roll-to-roll gravure-printed carbon nanotube-based active matrix for multi-touch sensors", *Scientific Reports*, 5, 17707, 2015 (doi: 10.1038/srep17707).
56. W. Hsu, C. M. Sutter-Fella, M. Hettick, L. Cheng, S. Chan, Y. Chen, Y. Zeng, M. Zheng, H.-P. Wang, C.-C. Chiang, A. Javey. "Electron-Selective TiO₂ Contact for Cu(In,Ga)Se₂ Solar Cells", *Scientific Reports*, 5, 16028, 2015 (doi: 10.1038/srep16028).
57. D. Kiriya, Y. Zhou, C. Nelson, M. Hettick, S. R. Madhupathy, K. Chen, P. Zhao, M. Tosun, A. M. Minor, D. C. Chrzan, A. Javey. "Oriented Growth of Gold Nanowires on MoS₂", *Advanced Functional Materials*, 25, 6257–6264, 2015.
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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 a 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:** Javey co-leads (along with Yi Cui of Stanford) Bay Area Photovoltaic Consortium (BAPVC). The consortium was established in 2011 by a \$25 million funding from U.S. Department of Energy (DOE) to help advance the U.S. PV manufacturing industry. The consortium consists of ~35 co-PIs from 18 different institutions. BAPVC is a unique partnership joining universities and industry with the mission of developing advanced technologies to deliver high-performance photovoltaic modules at low-cost. BAPVC brings a revolutionary approach to creating the environment needed to promote great innovation. While setting the scope for university research in topics with explicit industry support assures relevance of results, the consortium's premise is 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.** Javey has been leading E-Mat since Fall 2010. 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 a number of 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.
- ❖ **Associate editor, ACS Nano.** Javey has served as an associate editor of the journal *ACS Nano* since May 2011. Published monthly, *ACS Nano* (IF~12) is an international forum for the communication of comprehensive articles on nanoscience and nanotechnology research at the interfaces of chemistry, biology, materials science, physics, and engineering. Moreover, the journal helps facilitate communication among scientists from these research communities in developing new research opportunities, advancing the field through new discoveries, and reaching out to scientists at all levels.

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>