Polina Anikeeva
Associate Professor
Materials Science and Engineering and Brain and Cognitive Sciences
Massachusetts Institute of Technology

Work Address:
Massachusetts Institute of Technology
Department of Materials Science and Engineering
Research Laboratory of Electronics
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Education

2009 – Ph.D. Materials Science and Engineering, MIT

2003 – BS (Honors), Physics (concentration Biophysics),
St.Petersburg State Polytechnic University (SPbSPU).

Positions

2018-current – Associate Professor, Department of Brain and Cognitive Sciences, MIT

2018-current – Associate member, McGovern Institute for Brain Research, MIT

2017-current – Associate director, Research Laboratory of Electronics, MIT

2016-current – Associate Professor, Department of Materials Science and Engineering, MIT

2011-2016 – Assistant Professor, Department of Materials Science and Engineering, MIT

2009-2011 – Postdoctoral fellow, Optical Neural Engineering Lab (Prof. Karl Deisseroth),
Department of Bioengineering, Stanford

2004-2009 – Ph.D. student, Laboratory of Organic Electronics and Optics (Prof. Vladimir Bulović),
Department of Materials Science and Engineering, MIT

2003-2004 – Research assistant, Softmatter Nanotechnology and Advanced Spectroscopy Team,
Chemistry Division, Los Alamos National Laboratory

2002-2003 – Research assistant, Department of Physical Chemistry,
Swiss Federal Institute of Technology (ETH Zürich)

Selected Fellowships and awards

- 2020 MacVicar Faculty Fellowship
- 2019 MITx Prize for Teaching and Learning in MOOCs
- 2018 Vilcek Prize for Creative Promise in Biomedical Sciences
- 2016 NIH BRAIN Award
- 2015 Junior Bose Teaching Award, School of Engineering, MIT
- 2015 Bose Research Grant
- 2015 Technology Review TR35
- 2014 EMBS Brain Grand Challenges Young Investigator Award
- 2014 Outstanding Faculty Undergraduate Research (UROP) Mentor
- 2013 Speaker, US NAE Frontiers of Engineering
- 2013 Dresselhaus Fund Inaugural Award
- 2013 DARPA Young Faculty Award
- 2013 NSF CAREER Award
- 2012 Center for Materials Science and Engineering Shared Facilities Junior Faculty Award
- 2011 Sanofi Biomedical Innovation Program Award

Publications

1. Varnavides, G., Jermyn, A., **Anikeeva, P.**, Felser, C., Narang, P. *Generalized Electron Hydrodynamics, Vorticity Coupling, and Hall Viscosity in Crystals*. arXiv:2002.08976. Accepted Nat. Comms. 2020.
2. Park, J., Tabet, A., Moon, J., Chiang, P., Koehler, F., Sahasrabudhe, A., **Anikeeva, P.**, *Remotely Controlled Proton Generation for Neuromodulation.* Nano Lett. 2020, doi:10.1021/acs.nanolett.0c02281.
3. Moon, J., Christiansen, M.G., Rao, S., Marcus, C., Bono, D.C., Rosenfeld, D., Gregurec, D., Varnavides, G., Chiang, P., Park, S., **Anikeeva, P.** *Magnetothermal Multiplexing for Selective Remote Control of Cell Signaling.* Adv. Funct. Mater. 2020, doi:10.1002/adfm.202000577.
4. Rosenfeld, D., Senko, A.W., Moon, J., Yick, I, Varnavides, G., Gregureć, D., Koehler, F., Chiang, P., Christiansen, M. G., Maeng, L.Y., Widge, A.S., **Anikeeva, P.**, *Remote Magnetothermal Control of Adrenal Hormones*. Science Advances 6, eaaz3734, 2020.
5. Park, J., Jin, K., Sahasrabudhe, A., Chiang, P., Maalouf, J.H., Koehler, F., Rosenfeld, D., Rao, S., Tanaka, T., Khudiyev, T., Schiffer, Z.J., Fink, Y., Yizhar, O., Manthiram, K., Anikeeva, P., *In situ Electrochemical Generation of Nitric Oxide for Neuronal Modulation*. Nat. Nanotechnol. 15, 690–697, 2020.
6. Gregurec, D., Senko, A.W., Chuvilin, A., Reddy, P.D., Sankararaman, A., Rosenfeld, D., Chiang, P., Garcia, F., Tafel, I., Varnavides, G., Ciocan, E., **Anikeeva, P.** *Magnetic Vortex Nanodiscs Enable Remote Magnetomechanical Neural Stimulation.* ACS Nano 14, 8036–8045, 2020. Cover.
7. Sun, X., Bernstein, M.J., Meng, M., Rao, S.,Sørensen, A.T., Yao, L., Zhang, X., **Anikeeva, P.**, Lin, Y., *Functionally Distinct Neuronal Ensembles within the Memory Engram*. Cell 181, 410-423, 2020.
8. Guo, Y., Werner, C.F., Canales, A., Yu, L., Jia, X., **Anikeeva, P.**, Yoshinobu, Y., *Polymer-fiber-coupled field-effect sensors for label-free deep brain recordings*. PLOS One 15(1), e0228076, 2020.
9. Tabet, A., Gebhart, T., Wu, G., Readman, C., Smela, M.P., Rana, V., Baker, C., Bulstrode, H., **Anikeeva, P.**, Rowitch, D.H., Scherman, O. A*pplying Support-Vector Machine Learning Algorithms towards Predicting Host-Guest Interactions with Cucurbit[7]uril*. Phys. Chem. Chem. Phys. 22, 14976-14982, 2020.
10. Rao, S., Chen, R., LaRocca, A.A., Christiansen, M.G., Senko, A.W., Shi, C.H., Chiang, P., Varnavides, G., Xue, J., Zhou, Y., Park, S., Ding, R., Moon, J., Feng, G., **Anikeeva, P.** *Remotely Controlled Chemomagnetic Modulation of Targeted Neural Circuits.* Nat. Nanotechnol. 14, 967–973, 2019.
11. Frank, J.A., Antonini, M.-J., **Anikeeva, P.** *Next-generation interfaces for studying neural function*, Nat. Biotechnol. 37, 1013–1023, 2019.
12. Varnavides, G., Jermyn, A., **Anikeeva, P.**, Narang, P. *Non-Equilibrium Phonon Transport Across Nanoscale Interfaces.* Phys. Rev. B 100, 115402, 2019.
13. Shahriari, D., Loke, Z. J. G., Tafel, I., Park, S., Chiang, P., Fink, Y., **Anikeeva, P.** *Scalable Fabrication of Porous Microchannel Nerve Guidance Scaffolds with Complex Geometries.* Adv. Mater., 31, 1902021, 2019.
14. Kanik, M., Orguc, S., Varnavides, G., Kim, J., Benavides, T., Gonzalez, D., Akintilo, T., Tasan, C.C., Chandrakasan, A.P., Fink, Y., **Anikeeva, P.** *Strain-programmable fiber-based artificial muscle*, Science 365, 145-150, 2019. Cover.
15. Christiansen, M.G., Senko, A.W., **Anikeeva, P.** *Magnetic Strategies for Nervous System Control*, Annu. Rev. Neurosci. 42, 2019. doi: 10.1146/annurev-neuro-070918-050241.
16. Park, S., Loke, G., Fink, G., **Anikeeva, P.** *Flexible Fiber-Based Optoelectronics for Neural Interfaces*, Chem. Soc. Rev. 48, 1826-1852, 2019.
17. Roet, M., Rutten, B., Hescham, S., Jahanshahi, A., **Anikeeva, P.**, Temel, Y. *Progress in neuromodulation of the brain; a role for magnetic nanoparticles?* Prog. Neurobiol. 177, 1-14, 2019.
18. Park, S., Frank, J.A., **Anikeeva, P.**, *Silicon biointerfaces for all scales*, Nat. Biomed. Eng. 2, 471–472, 2018.
19. Kilias, A., Canales, A., Froriep, U.P., Park, S., Egert, U., **Anikeeva, P.** Optogenetic entrainment of neural oscillations with thermally drawn probes. J. Neur. Eng. 15, 056006, 2018.

20. Mondello, S., Sunshine, M., Fischedick, A., Dreyer, S., Horwitz, G., **Anikeeva, P.**, Horner, P., Moritz, C.T., *Optogenetic surface stimulation of the rat cervical spinal cord*. J. Neurophysiol. 120, 795-811, 2018.
21. Canales, A., Park, S., Kilias, A., **Anikeeva, P.** Multifunctional Fibers as Tools for Neuroscience and Neuroengineering, Acc. Chem. Res. 51, 829-838, 2018.
22. Christiansen, M.G., How, C., Bono, D.C., Perreault, D.J., **Anikeeva, P.** *Practical Methods for Generating Alternating Magnetic Fields for Biomedical Research*, Rev. Sci. Instr. 88, 084301, 2017.
23. Tian, B., Xu, S., Rogers, J.A., Cestellos-Blanco, S., Yang, P., Carvalho-de-Souza, J., Bezanilla, F., Liu, J., Bao, Z., Hjort, M., Cao, Y., Melosh, N., Lanzani, G., Benfenati, F., Galli, G., Gygi, F., Kautz, R., Gorodetsky, A.A., Kim, S.S., Lu, T.K., **Anikeeva, P.**, Cifra, M., Krivosudský, O., Havelka, D., Jiang, Y.*, Roadmap on semiconductor–cell biointerfaces*, Physical Biology, 2017.
24. Lu, C., Park, S., Richner, T., Derry, A., Brown, I., Kang, J., Hou, C., Fink, Y., Moritz, C.T., **Anikeeva, P.** *Flexible and Stretchable Fibers for Optoelectronic Probing of Spinal Cord Circuits*, Sci. Adv. 3, e1600955, 2017.
25. Park, S., Guo, Y., Jia, X., Choe, H.K., Grena, B., Park, J., Lu, C., Canales, A., Chen, R., Yim, Y.S., Choi, G.B., Fink, Y., **Anikeeva, P.** *One-Step Optogenetics with Multifunctional Flexible Polymer Fibers*, Nat. Neurosci. 20, 612, 2017.
26. Chen, R., Canales, A., **Anikeeva, P.** *Neural Recording and Modulation Technologies,* Nat. Rev. Mater. 2, 16093, 2016.
27. Romero, G., Christiansen, M.G., Stocche Barbosa, L., Garcia, F., **Anikeeva, P.** *Localized Excitation of Neural Activity via Rapid Magnetothermal Drug Release.* Adv. Funct. Mater. 26, 6471, 2016.
28. **Anikeeva, P.**, Jasanoff, A.P. *Magnetogenetics: Problems on the back of an envelope*, eLife 5:e19569, 2016.
29. Schuerle, S., Dudani, J.S., Christiansen, M.G., **Anikeeva, P.**, Bhatia, S.N. *Magnetically Actuated Protease Sensors for In Vivo Tumor Profiling.* Nano Lett. 16, 6303, 2016.
30. Chen, R., Christiansen, M.G., Sourakov, A., Mohr, A., Matsumoto, Y., Okada, S., Jasanoff, A., **Anikeeva, P.** *High-performance ferrite nanoparticles through nonaqueous redox phase tuning,* Nano Lett. 16, 1345, 2016.
31. Ruckh, T.T., Skipwith, C.G., Chang, W., Senko, A.W., Bulović, V., **Anikeeva, P.**, Clark, H.A. *Ion-Switchable Quantum Dot FRET Rates In Ratiometric Potassium Sensors.* ACS Nano 10, 4020, 2016.
32. **Anikeeva, P.** *Optogenetics unleashed*, Nat. Biotechnol. 34, 43, 2016.
33. Koppes, R.A., Park, S., Hood, T., Jia, X., Poorheravi, N.A., Achyuta, A.K.H., Fink, Y., **Anikeeva, P.** *Thermally Drawn Fibers as Nerve Guidance Scaffolds.* Biomaterials 81, 27, 2016.
34. Matsumoto, Y., Chen, R., **Anikeeva, P.**, Jasanoff, A.P., *Engineering intracellular biomineralization and biosensing by a magnetic protein***,** Nat. Comms. 6, 8721, 2015.
35. Loynachan, C. N., Romero, G., Christiansen, M.G., Chen, R., Ellison, R., O'Malley, T.T., Froriep, U.P., Walsh, D.M., **Anikeeva, P.** *Targeted Magnetic Nanoparticles for Remote Magnetothermal Disruption of Amyloid-β Aggregates*, Adv. Healthcare Mater. 4, 2100, 2015. Cover.
36. **Anikeeva, P.**, Koppes, R.A., *Restoring the Sense of Touch*, Science 350, 274, 2015.
37. **Anikeeva, P.**, Jia, X. *Remote-Controlled Mice*, Cell Systems 1, 104, 2015
38. Park, S., Koppes, R.A., Froriep, U.P., Jia, X., Achyuta, A.K.H., McLaughlin, B.L., **Anikeeva, P.**, O*ptogenetic control of nerve growth,* Sci. Rep. 5, 9669, 2015.
39. Chen, R., Romero, G., Christiansen, M.G., Mohr, A., **Anikeeva, P.**, *Wireless magnetothermal deep brain stimulation*, Science 347, 1477, 2015. (Perspectives by Temel and Jahanshahi, Science 347, 1418, 2015.)
40. Canales,* A., Jia,* X., Froriep,* U.P., Koppes,* R.A., Tringides, C.M., Selvidge, J., Lu, C., Wei, L., Hou, C., Fink, Y., **Anikeeva, P.**, *Multifunctional fibers for optical, electrical and chemical interrogation of neural circuits in vivo,* Nat. Biotechnol. 33, 277, 2015. * - Equal contribution. Cover. (News and Views by Herrera and Adamantidis, Nat. Biotechnol. 33, 259, 2015.)
41. Lu, C., Froriep, U.P., Canales, A., Koppes, R.A., Caggiano, V., Selvidge, J., Bizzi, E., **Anikeeva, P.**, *Polymer Fiber Probes Enable Optical Control of Spinal Cord and Muscle Function In Vivo*, Adv. Funct. Mater. 24, 6594, 2014. Back cover.

42. Guynaydin, L.A., Grosenick, L, Finkelstein, J.C., Kauvar, I.V., Fenno, L.E., Adhikari, A., Lammel, S., Mirzabekov, J.J., Airan, R.D., Tye, K.M., **Anikeeva, P.**, Malenka, R.C., Deisseroth, K. *Natural neural projection dynamics underlying social behavior modulation*. Cell, 157, 1535, 2014.
43. Pashaie, R., **Anikeeva, P.**, Lee, J.H., Prakash, R., Yizhar, O., Prigge, M., Chander, D., Richner, T., Williams, J. *Optogenetic brain interfaces,* IEEE Rev. Biomed. Eng. 7, 3-30, 2014.
44. Birmingham, K., Gradinaru, V., **Anikeeva, P.**, Grill, W.M., Pikov, V., Weber, D., McLaughlin, B., Pasricha, P., Ludwig, K., Famm, K. *A research roadmap towards bioelectronic medicines*, Nat. Rev. Drug Disc. 13, 399, 2014.
45. Christiansen, M.G., Senko, A.W., Chen, R., Romero Uribe, G., **Anikeeva, P.** *Magnetically multiplexed heating of single domain nanoparticles.* Appl. Phys. Lett. 104, 213103-8, 2014.
46. Chen, R., Christiansen, M.G., **Anikeeva, P.**, *Maximizing hysteretic losses in magnetic ferrite nanoparticles via model-driven synthesis and materials optimization*. ACS Nano, 7, 8990, 2013.
47. Liske, H., Qian, X., **Anikeeva, P.**, Deisseroth, K., Delp, S. *Optical control of neuronal excitation and inhibition using a single opsin protein, ChR2.* Sci. Rep., 3, 3110, 2013.
48. Liske, H., Towne, C., **Anikeeva, P.**, Zhao, S., Feng, G., Deisseroth, K., Delp, S. *Optical inhibition of motor neuron and muscle activity in vivo.* Muscle and Nerve, 47, 916, 2013.
49. **Anikeeva, P**., Deisseroth, K., *Photothermal genetic engineering.* ACS Nano, 6, 7548, 2012.
50. **Anikeeva,* P.**, Andalman,* A.S., Witten, I.B., Warden, M.R., Goshen, I., Grosenick, L., Gunaydin, L.A., Frank, L., Deisseroth, K. *Optetrode: a multichannel readout for optogenetic control in freely moving mice.* Nat. Neurosci., 15, 163, 2011. * - Equal contribution
51. Witten, I.B., Lin, S.C., Brodsky, M., Prakash, R., Diester, I., **Anikeeva, P**., Gradinaru, V., Ramakrishnan, C., Deisseroth, K. *Cholinergic interneurons control local circuit activity and cocaine conditioning.* Science, 330, 1677, 2010.
52. Shirasaki, Y., **Anikeeva, P.O.,** Tischler, J.R., Bradley, M.S., Bulović, V. *Efficient Förster energy transfer from phosphorescent organic molecules to J-aggregate thin films*, Chem. Phys. Lett., 485, 243, 2010.
53. Panzer, M.J., Aidala, K.E., **Anikeeva, P.O**., Halpert, J.E., Bawendi, M.G., Bulović V. *Nanoscale morphology revealed at the interface between colloidal quantum dots and organic semiconductor films.* Nano Lett., 10, 2421, 2010.
54. **Anikeeva, P.O.,** Halpert J. E., Bawendi, M.G., Bulović, V. *Quantum dot light-emitting devices with electroluminescence tunable over the entire visible spectrum*, Nano Lett., 9, 2532, 2009.
55. Hummon, M.R., Stollenwerk, A.J. , Narayanamurti, V. , **Anikeeva, P.O**., Panzer, M.J., Wood, V.C., Bulović, V. *Detecting Charging Energy and Charge State of CdSe/ZnS Quantum Dots using a Scanning Tunneling Microscope.* Phys. Rev. B, 81, 115439, 2009.
56. **Anikeeva, P.O**., Madigan, C.F., Halpert, J.E., Bawendi, M.G., Bulovic, V. *Electronic and Excitonic Processes in Hybrid Organic-Quantum Dot LEDs*, Phys. Rev. B, 78, 085434, 2008.
57. Kim, L., **Anikeeva, P. O.,** Coe-Sullivan, S. A., Steckel J. S., Bawendi, M. G., Bulović, V. *Contact Printing of Quantum Dot Light Emitting Devices*, Nano Lett., 8, 5413, 2008.
58. **Anikeeva, P.O.,** Halpert J. E., Bawendi, M.G., Bulovic, V. *Electroluminescence from a Mixed Red-Green-Blue Colloidal Quantum Dot Monolayer*, Nano Lett., 7, 2196, 2007.
59. **Anikeeva, P.O.,** Madigan C. F., Coe-Sullivan, S. A., Steckel, J.S., Bawendi, M.G., Bulovic, V. *Photoluminescence of CdSe/ZnS core/shell quantum dots enhanced by energy transfer from a phosphorescent donor*, Chem. Phys. Lett., 424, 120, 2006.
60. Steckel, J.S., Snee, P., Coe-Sullivan, S. A., Zimmer, J.P., Halpert, J. E., **Anikeeva, P.O**., Kim, L., Bulovic, V., Bawendi, M.G. *Color-Saturated Green-Emitting QD-LEDs*, Angew. Chem. Int. Ed., 45, 5796, 2006.
61. Ivanov, S.A., Nanda, J., Piryatinski, A., Achermann, M., Balet, L.P., Bezel, I. V., **Anikeeva, P.O.**, Tretiak, S., Klimov, V. I. *Light Amplification Using Inverted Core/Shell Nanocrystals: Towards Lasing in Single-Exciton Regime*, J. Phys. Chem., 108, 10625, 2004.

Patents and patent applications

1. Anikeeva, P.O., Kanik, M. "Method for forming thermal-responsive fibers" US Application 16/427,540.
2. Anikeeva, P.O., Fink, Y., Shahriari, D., Loke, Z.J.G., Tafel, I., "Structures with Complex Geometries and Controlled Porosity in Micrometer to Meter Dimensions Produced at Large Scale", US Application 62/772968.
3. R. Chen, P. O. Anikeeva, A. Sourakov, "*Nanoparticles and Methods of Making* ", US and international patent application PCT/US2016/063450.
4. Anikeeva, P.O., Canales, A., Jia, X., Froriep, U.P., Lu, C., Tringides, C.M., Y. Fink, *"Methods and Apparatus for Stimulating and Recording Neural Activity",* US Patent 9,861,810, issued on January 9, 2018.
5. Anikeeva, P.O, Christiansen, M.G., R. Chen, *"Independent Magnetically-Multiplexed Heating of Portions of a Target",* US Patent 9,681,979, issued June 20, 2017.
6. Anikeeva, P.O., Deisseroth K. "*Upconversion of light for use in optogenetic methods"*, US Patent 9,522,288, issued December 20, 2016.
7. Halpert, J.E., Anikeeva, P.O., Bawendi, M.G., Bulović, V. "*Blue Light Emitting Semiconductor Nanocrystals and Devices",* US patent 9,505,978 issued November 29, 2016.
8. Chen, J., Bulović, V., Anikeeva, P.O., Bawendi, M.G. "Light Emitting Device Including Semiconductor Nanocrystals", US Patent 8,941,299, issued January 27, 2015.
9. Coe-Sullivan, S. A., Bulović, V., Steckel, J. S., Bawendi, M.G., Anikeeva, P.O., Halpert, J.E. "*White Light Emitting Devices",* US Patent 9,093,657, issued July 28, 2015.
10. Hollingsworth, J.A., Klimov, V.I., Anikeeva, P.O. "*Semiconductor nanocrystal quantum dots and metallic nanocrystals as UV blockers and colorants for sunscreen and/or sunless tanning compositions",* US patent application US10/857,583.

Professional service and synergistic activities

2019-current - Co-organizer of for the FL01: Symposium Bioelectronic Materials for Neural Interfaces—Stimulation, Sensing, Power and Packaging at the Spring/Fall 2020 Materials Research Society Annual Meeting (combined virtual meeting due to COVID-19 pandemic).

2018 - 2019 – Co-organizer of for the Symposium SB02: Multiscale Materials Engineering within Biological Systems at the Fall 2019 Materials Research Society Annual Meeting.

2018-2019 – Member, BRAIN Initiative Advisory Committee to Director (ACD) Working Group

2017-2018 – Guest editor, Accounts of Chemical Research (Bioelectronics issue)

2017-2018 – Guest editor, Current Opinion in Neurobiology (Neurotechnologies issue)

2014-2018 – Member, NIH BNVT study section

2017 - Primary organizer for the Symposium BM08: Materials Design for Neural Interfaces at the Fall Materials Research Society Annual Meeting, 11/27-12/1/2017.

2013 – Co-organizer (with Shain and Kassegne) of the Center for Sensorimotor Neural Engineering Microelectrode Workshop, Seattle 01/18-01/19/2013.

2013 – Primary organizer for the Symposium J: Materials for Neural Interfaces at the Fall Materials Research Society Annual Meeting, 1-6/12/2013.

2013-2018– Initiated a community college outreach program. Hosted 9-week laboratory summer internships for 7 faculty and 8 students from Roxbury and Bunker Hill Community colleges (inner city Boston area colleges).

2011-present – Undergraduate research supervisor through MIT Undergraduate Research Opportunities Program (UROP) - 45 students, Center for Materials Science and Engineering Research Experiences for Undergraduates (CMSE REU) - 6 students, MIT Summer Research Program (MSRP) - 2 students.

2012-2013 – High school research supervisor - 1 student from Swampscott High School, MA.

Member of Materials Research Society (MRS), Society for Neuroscience (SfN)

Reviewer for Science and AAAS Journals, Nature and NPG Journals, Optical Society of America (OSA) Journals, IEEE Journals, American Chemical Society (ACS) Journals.

Proposal reviewer for National Science Foundation, National Institutes of Health (BNVT and BRAIN study sections), European Research Counsel, Cariplo Foundation (Italy), Human Frontiers Program, Natural Sciences and Engineering Research Council of Canada.