

Tse Nga Tina Ng

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Professional Preparation

Knox College, Galesburg, IL	Chemistry	B.A.	2000
Cornell University, Ithaca, NY	Physical Chemistry	Ph.D.	2006
Palo Alto Research Center, Palo Alto, CA	Electronic Devices Lab	postdoc	2006-2008

Appointments

2022-Current	Professor, University of California San Diego
2016-2022	Associate Professor, University of California San Diego
2011-2015	Senior Member of Research Staff, Palo Alto Research Center, CA
2008-2011	Member of Research Staff, Palo Alto Research Center, CA

Honors

2012	Flextech Innovation Award, where Flextech is an industrial consortium
2012	Wall Street Journal Technology Innovation Award, Runner-up
2012	PARC Golden Acorn Award, which recognized the inventor of a patent that adds significant value to the PARC IP assets
2014	Grainger Foundation Grant for Interdisciplinary Research awarded by NAE
2017	Hartwell Foundation Investigator
2017	Bell Lab Prize for a game-changing global technology, Second Place
2021	NSF Mid-Career Advancement Award
2021	Fellow of National Academy of Inventors

Community Service

2012-2018	Board Member, External Advisory Committee of NSF Partnership for Research and Education in Materials Center at UC Santa Barbara and UT El Paso
2016-2018	member of Flexible Electronics and Displays Technical Committee in IEEE Electron Device Society
2015-present	Associate Editor, Institute of Physics Journal <i>Printed Flexible Electronics</i>
2019-present	Advisory Board, American Chemical Society Journal <i>ACS Applied Electronic Materials</i>
2021-present	Associate Editor, <i>IEEE Journal of Flexible Electronics</i>
2016-present	Session organizer for various conferences (IEEE International Electron Devices Meeting IEDM, IEEE International Conference on Flexible, Printed Sensors and Systems FLEPS, Materials Research Society, etc.); Diversity & Inclusion Chair in FLEPS

Publications

1. C. Shin, N. Li, B. Seo, N. Eedugurala, J. D. Azoulay, T. N. Ng, Heterojunction bilayers serving as a charge transporting interlayer reduce the dark current and enhance photomultiplication in organic shortwave infrared photodetectors, *Materials Horizon*, (2022), doi: 10.1039/d2mh00479h.

2. Y. Zhai, M. T. Tolley, T. N. Ng, Digital Programming of Liquid Crystal Elastomers to Achieve High-Fidelity Surface Morphing, *Applied Materials Today*, 27, (2022), 101501.
3. S.-E. Wu, A. Shiller, A. Barnard, J. D. Azoulay, T. N. Ng, Point-of-use printed nitrate sensor with desalination units, *Microchimica Acta*, 189, (2022), doi: 10.1007/s00604-022-05314-5.
4. N Li, N. Eedugurala, J. D. Azoulay, T. N. Ng. A filterless organic photodetector electrically switchable between visible and infrared detection, *Cell Reports Physical Science*, 3, (2022), 100711.
5. L. Yao, J. Liu, N. Eedugurala, P. Mahalingavelar, D. J. Adams, K. Wang, K. S. Mayer, J. D. Azoulay, T. N. Ng, Ultrafast high-energy micro-supercapacitors based on open-shell polymer-graphene composites, *Cell Reports Physical Science*, 3, (2022), 100792.
6. A. R. Benasco, J. Tropp, V. Kaphle, Y. Chen, W. Zhao, N. Eedugurala, T. N. Ng, A. H. Flood, J. D. Azoulay, Receptor Induced Doping of Conjugated Polymer Transistors: A Strategy for Selective and Ultrasensitive Phosphate Detection in Complex Aqueous Environments, *Advanced Electronic Materials*, (2022), 2101353.
7. W. Kim, S.-K. Kim, S. Jeon, J. Ahn, B. K. Jung, S. Y. Lee, C. Shin, T.-Y. Seong, S. Jeong, H. S. Jang, T. N. Ng, S. J. Oh. Patterning All-Inorganic Halide Perovskite with Adjustable Phase for High-Resolution Color Filter and Photodetector Arrays. *Advanced Functional Materials*, 2022, 2111409.
8. B. K. Jung, H. K. Woo, C. Shin, T. Park, N. Li, K. J. Lee, W. Kim, J. H. Bae, J.-P. Ahn, T. N. Ng, S. J. Oh, Suppressing the Dark Current in Quantum Dot Infrared Photodetectors by Controlling Carrier Statistics, *Advanced Optical Materials*, 2022, 10, 2101611.
9. N. Li, P. Mahalingavelar, J. H. Vella, D.-S. Leem, J. D. Azoulay, T. N. Ng. Solution-processable infrared photodetectors: Materials, device physics, and applications, *Materials Science & Engineering Reports*, 146, (2021), 100643.
10. Y. Zhai, T. N. Ng. Self-Sustained Robots Based on Functionally Graded Elastomeric Actuators Carrying up to 22 Times Their Body Weight, *Advanced Intelligent Systems*, (2021), 2100085.
11. N. Li, N. Eedugurala, D.-S. Leem, J. D. Azoulay, T. N. Ng, Organic Upconversion Imager with Dual Electronic and Optical Readouts for Shortwave Infrared Light Detection, *Advanced Functional Materials*, 31, (2021), 2100565.
12. J. H. Vella, L. Huang, N. Eedugurala, K. S. Mayer, T. N. Ng, J. D. Azoulay, Broadband Infrared Photodetection Using a Narrow Bandgap Conjugated Polymer, *Science Advances*, 7, (2021), eabg2418.
13. D.-S. Leem, K.-H. Lee, N. Li, B. W. Park, T. Choi, T. Ro, O. K. Kwon, Y.-N. Kwon, T. N. Ng, S. Kim, Highly Responsive and Thermally Reliable Near-Infrared Photodiodes Utilizing Naphthalocyanine Molecules Tuned with Axial Ligands, *Advanced Optical Materials*, 9, (2021), 2001682.
14. S.-E. Wu, L. Yao, A. Shiller, A. H. Barnard, J. D. Azoulay, T. N. Ng, Dual-Gate Organic Electrochemical Transistors for Marine Sensing, *Advanced Electronic Materials*, (2021), 2100223.
15. M. K. Rahman, T. H. Phung, S. Oh, S. H. Kim, T. N. Ng, K.-S. Kwon, High-Efficiency Electro Spray Deposition Method for Nonconductive Substrates: Applications of Superhydrophobic Coatings, *ACS Applied Materials & Interfaces*, 13, (2021), 18227.

16. Y. Bonnassieu, et al., The 2021 Flexible and Printed Electronics Roadmap, *Flexible and Printed Electronics*, 6, (2021), 023001.
17. Y. Cagri, M. Sam, B. Yifeng, M. Amit, A. J. Skalsky, M. Yip, T. N. Ng, H. Garudadri. Artifacts Mitigation in Sensors for Spasticity Assessment, *Advanced Intelligent Systems*, 3, (2021), 2000106.
18. Z. Wu, N. Li, N. Eedugurala, J. D. Azoulay, D. S. Leem, T. N. Ng. Noise and Detectivity Limits in Organic Shortwave Infrared Photodiodes with Low Disorder, *NPJ Flexible Electronics*, 4, (2020) 6.
19. Y. Zhai, Z. Wang, K. S. Kwon, S. Cai, D. J. Lipomi, T. N. Ng. Printing Multi-Material Organic Haptic Actuators, *Advanced Materials* (2020), 2002541.
20. K. Wang, L Yao, M. Jahon, J. Liu, M. Gonzalez, P. Liu, V. Leung, X. Zhang, T. N. Ng. Ion-Exchange Separators Suppressing Self-Discharge in Polymeric Supercapacitors, *ACS Energy Letters*, 5, (2020), 3276.
21. K. N. Al-Milaji, H. Qijin, Z. Li, T. N. Ng, H. Zhao. Direct Embedment and Alignment of Silver Nanowires by Inkjet Printing for Stretchable Conductors, *ACS Applied Electronic Materials*, 2, (2020), 3289.
22. N. Li, J. Lim, J. D. Azoulay, T. N. Ng. Tuning the Charge Blocking Layer to Enhance Photomultiplication in Organic Shortwave Infrared Photodetectors, *Journal of Materials Chemistry C*, 8, (2020), 15142.
23. K. Wang, L. Huang, N. Eedugurala, S. Zhang, M. A. Sabuj, N. Rai, X. Gu, J. D. Azoulay, T. N. Ng. Wide Potential Window Supercapacitors Using Open-Shell Donor-Acceptor Conjugated Polymers with Stable N-Doped States, *Advanced Energy Materials*, 9, (2019), 1902806.
24. M. Amit, L. Chukoskie, A. Skalsky, H. Garudadri, T. N. Ng. Flexible Pressure Sensors for Objective Assessment of Motor Disorders, *Advanced Functional Materials*, 30, (2019) 1905241.
25. K. Wang, U. Parekh, J. K. Ting, N. A. D. Yamamoto, J. Zhu, T. Constantini, A. C. Arias, B. P. Eliceiri, T. N. Ng. A Platform to Study the Effects of Electrical Stimulation on Immune Cell Activation During Wound Healing. *Advanced Biosystems*, 3, (2019), 1900106.
26. H. Kim, Z. Wu, N. Eedugurala, J. D. Azoulay, T. N. Ng. Solution-Processed Phototransistors Combining Organic Absorber and Charge Transporting Oxide for Visible to Infrared Light Detection, *ACS Applied Materials & Interfaces*, 11, (2019), 36880.
27. W. Yao, Z. Wu, E. Huang, A. E. London, Z. Liu, J. D. Azoulay, T. N. Ng. Organic Bulk Heterojunction Infrared Photodiodes for Imaging out to 1300 nm, *ACS Applied Electronic Materials*, 1, (2019), 660.
28. M. Amit, R. K. Mishra, Q. Hoang, A. M. Galan, J. Wang, T. N. Ng. Point-of-Use Robotic Sensors for Simultaneous Pressure Detection and Chemical Analysis, *Materials Horizon*, 6, (2019), 604.
29. Z. Wu, Y. Zhai, H. Kim, J. D. Azoulay, T. N. Ng. Emerging Design and Characterization Guidelines for Polymer-Based Infrared Photodetectors, *Accounts of Chemical Research*, 51, (2018), 3144.
30. Z. Wu, Y. Zhai, W. Yao, N. Eedugurala, S. Zhang, L. Huang, X. Gu, J. D. Azoulay, T. N. Ng. The Role of Dielectric Screening in Organic Shortwave Infrared Photodiodes for Spectroscopic Image Sensing, *Advanced Functional Materials*, 28, (2018), 1805738.

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34. Z. Wu, W. Yao, A. E. London, J. D. Azoulay, T. N. Ng. Elucidating the Detectivity Limits in Shortwave Infrared Organic Photodiodes. *Advanced Functional Materials*, 28 (2018) 1800391.
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39. T. N. Ng, D. E. Schwartz, P. Mei, S. Kor, J. Veres, P. Broms, C. Karlsson, "Pulse Voltage Multiplier Based on Printed Organic Devices," *Flexible Printed Electronics*, 1 (2016) 015002.
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42. T. N. Ng, D. E. Schwartz, P. Mei, B. Krusor, S. Kor, J. Veres, P. Broms, T. Eriksson, Y. Wang, O. Hagel, C. Karlsson, "Printed Dose-recording Tag Based on Organic Complementary Circuits and Ferroelectric Nonvolatile Memories," *Scientific Reports*, 5 (2015) 13457.
43. K. S. Kwon, T. N. Ng, "Improving Electroactive Polymer Actuator by Tuning Ionic Liquid Concentration," *Organic Electronics*, 15 (2014) 294.
44. P. Mei, T. N. Ng, R. A. Lujan, D. E. Schwartz, S. Kor, B. S. Krusor, J. Veres, "Utilizing High Resolution and Reconfigurable Patterns in Combination with Inkjet Printing to Produce High Performance Circuits," *Applied Physics Letters*, 105 (2014) 123301.
45. R. A. Street, T. N. Ng, R. A. Lujan, I. Son, M. Smith, S. Kim, T. Lee, Y. Moon, S. Cho, "Sol-gel Solution-deposited InGaZnO Thin Film Transistors," *ACS Applied Materials & Interfaces*, 6 (2014) 4428.
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47. D. E. Schwartz, T. N. Ng, "Comparison of Static and Dynamic Printed Organic Shift Registers," *IEEE Electron Device Letters*, 34 (2013) 271.
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49. J. Kim, T. N. Ng, W. S. Kim, "Highly Sensitive Tactile Sensors Integrated with Organic Transistors," *Applied Physics Letters*, 101 (2012) 103308.
50. T. N. Ng, B. Russo, A. C. Arias, "Solution-processed Memristive Junctions Used in a Threshold Indicator," *IEEE Transactions on Electron Devics*, 58 (2011) 3435.
51. T. N. Ng, B. Russo, B. Krusor, R. Kist, A. C. Arias, "Organic Inkjet-patterned Memory Array Based on Ferroelectric Field-effect Transistors," *Organic Electronics*, 12 (2011) 2012.
52. W. S. Wong, T. N. Ng, S. Sambandan, M. L. Chabinye, "Materials, Processing, and Testing of Flexible Image Sensor Arrays," *IEEE Design & Test of Computers*, 28 (2011) 16.
53. T. N. Ng, S. Sambandan, J. H. Daniel, A. C. Arias, "Inkjet-patterned, Organic Complementary Circuits and Non-volatile Memory Arrays Based on Ferroelectric Field-effect Transistors," *Proceedings of Electrochemical Society Meeting: Symposium on Thin Film Transistors*, Las Vegas, Nevada (2010).
54. J. H. Daniel, T. N. Ng, A. C. Arias, S. R. Garner, "Pressure Sensors for Printed Blast Dosimeters," *Proceedings of IEEE Sensors Conference*, Waikola, Hawaii (2010).
55. T. N. Ng, W. S. Wong, R. A. Lujan, R. A. Street, "Characterization of Charge Collection in Photodiodes under Mechanical Strain: Comparison between Organic Bulk Heterojunction and Amorphous Silicon," *Advanced Materials*, 21 (2009) 1855.
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57. T. N. Ng, B. Russo, A. C. Arias, "Degradation Mechanisms of Organic Ferroelectric Field-effect Transistors Used as Nonvolatile Memory," *Journal of Applied Physics*, 106 (2009) 094505.
58. S. Sambandan, T. N. Ng, F. Endicott, "Software Prediction of Threshold Voltage Shift for Amorphous Silicon TFT-Based Displays," *Journal of Display Technology*, 4 (2008) 304.
59. T. N. Ng, W. S. Wong, M. L. Chabinye, S. Sambandan, R. A. Street, "Flexible Image Sensor Array with Bulk Heterojunction Organic Photodiode," *Applied Physics Letters*, 92 (2008) 213303.
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62. T. N. Ng, M. L. Chabinye, R. A. Street, A. Salleo, "Bias Stress Effects in Organic Thin Film Transistors," *Proceedings of IEEE International Reliability Physics Symposium*, Phoenix, Arizona (2007).

63. T. N. Ng, W. R. Silveira, J. A. Marohn, "Dependence of Charge Injection on Temperature, Electric Field, and Energetic Disorder in an Organic Semiconductor," *Physics Review Letters*, 98 (2007) 066101.
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65. T. N. Ng, W. R. Silveira, J. A. Marohn, "Non-ideal Behavior in a Model System: Contact Degradation in a Molecularly Doped Polymer Revealed by Variable-temperature Electric Force Microscopy," *Proceedings of SPIE*, 6336 (2006) 63360A.
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Patents

1. Producing layered structures with layers that transport charge carriers in which each of a set of channel regions or portions operates as an acceptable switch. USPTO Patent No. 7586080 B2, Michael L. Chabinye, Tse Nga Ng, September 8, 2009
2. Producing layered structures with semiconductive regions or subregions that transport charge carriers, USPTO Patent No. 7786430, Michael L. Chabinye, Tse Nga Ng, August 31, 2010
3. Producing layered structures with lamination. USPTO Patent No. 7755156 B2, Michael L. Chabinye, Tse Nga Ng, July 12, 2010
4. Charge mapping memory array formed of materials with mutable electrical characteristics. USPTO Patent No. 7679951 B2, William S. Wong, Sanjiv Sambandan, Tse Nga Ng, Robert A. Street, October 18, 2011
5. Flexible diagnostic sensor sheet. USPTO Patent No. 8059975 B2, Michael L. Chabinye, Tse Nga Ng, William S. Wong, Ashish Pattekar, John E. Northrup, Pengfei Qi, November 15, 2011
6. Organic memory array with ferroelectric field-effect transistor pixels. USPTO Patent No. 8158973 B2, Tse Nga Ng, Ana C. Arias, Sanjiv Sambandan, Jurgen H. Daniel, April 17, 2012
7. Printing shielded connections and circuits. USPTO Patent No. 8247883 B2, Jurgen H. Daniel, Tse Nga Ng, August 21, 2012
8. Producing layered structures with semiconductive regions or subregions. USPTO Patent No. 8283655 B2, Michael L. Chabinye, Tse Nga Ng, October 9, 2012
9. Method and apparatus for using thin-film transistors and MIS capacitors as light-sensing elements in charge mapping arrays. USPTO Patent No. 8300125 B2, Tse Nga Ng, Sanjiv Sambandan, William S. Wong, October 30, 2012
10. Protecting semiconducting oxides. USPTO Patent No. 8258021 B2, Tse Nga Ng, Michael L. Chabinye, July 30, 2013
11. Event sensor including printed electronic circuit. USPTO Patent No. 8624753 B2, Jurgen H. Daniel, Tse Nga Ng, January 7, 2014
12. Reconfigurable printed circuit sensor systems. USPTO Patent No. 8680401 B2, Tse Nga Ng, Jurgen H. Daniel, Ana C. Arias, Brent Krusor, March 25, 2014
13. Solution processed neutron detector. USPTO Patent No. 8872224B2, Gregory L. Whiting, Tse Nga Ng, Janos Veres, Robert A. Street, October 28, 2014

14. Self-powered manual toothbrush with sensors, Japan Patent No. 2014138852A, John Knights, Tse Nga Ng, July 31, 2014
15. Method for event sensing employing a printed event sensor, USPTO Patent No. 8698645 B2, J. H. Daniel, Tse Nga Ng, April 15, 2014
16. Printed interactive card with piezo-powered indicator. USPTO Patent No. 8976093 B2, Jurgen H. Daniel, Tse Nga Ng, March 10, 2015
17. Method of fabricating a card with piezo-powered indicator by printed electronics processes, USPTO Patent No. 8959734, J. H. Daniel, Tse Nga Ng, February, 24, 2015
18. Digital 3D fabrication using multi-layered mold. USPTO Patent No. 9156194 B2, Tse Nga Ng, JengPing Lu, Eugene M. Chow, Timothy David Stowe, Janos Veres, Philipp H. Schmaelzle, October 13, 2015
19. High-k dielectric with a low-k interface for solution processed devices. USPTO Patent No. 9219126 B2, Gregory L. Whiting, Tse Nga Ng, Bing R. Hsieh, December 22, 2015
20. UV sensor with nonvolatile memory using oxide semiconductor films. USPTO Patent No. 9263124 B2, Rene A. Lujan, Tse Nga Ng, Robert A. Street, February 16, 2016
21. Reconfigurable stretchable connector substrate. USPTO Patent No. 9288898 B2, Leah Lavery, Tse Nga Ng, March 15, 2016
22. Organic thin-film transistor. USPTO Patent No. 9356248 B2, Tse Nga Ng, Gregory L. Whiting, Ichiro Fujieda, Bing R. Hsieh, May 31, 2016
23. Gravure printing process using silver nanoparticle inks for high quality conductive features, USPTO Patent No. 9486996, Tse Nga Ng, Brent S. Krusor, A. Goredema, Y. Wu, November 8, 2016
24. Pre-fabricated substrate for printed electronic devices. USPTO Patent No. 406896 B2, Ping Mei, Janos Veres, Tse Nga Ng, Aug 2, 2016
25. Protocol for assigning features and tuning resolution in digital lithography. USPTO Patent No. 9451706 B1, Tse Nga Ng, Ping Mei, Steven E Ready, Sep 20, 2016
26. Electroactive polymer structures printed with varying compositions of ions. USPTO Patent No. 9437804 B2, Tse Nga Ng, Kye-Si Kwon, Sep 6, 2016
27. Method for roll-to-roll production of flexible, stretchy objects with integrated thermoelectric modules, electronics and heat dissipation. USPTO Patent No. 9543495 B2, John Steven Paschkewitz, Corie Lynn Cobb, David Mathew Johnson, Gabriel Iftime, Victor Alfred Beck, Tse Nga Ng, Ranjeet Rao, Jan 10, 2017
28. Printable pulsed voltage multiplier with adjustable pulse width and amplitude. USPTO Patent No. 9729047 B2, David Eric Schwartz, Tse Nga Ng, Aug 8, 2017
29. Circuit layout for thin film transistors in series or parallel. USPTO Patent No. 9735382 B2, Tse Nga Ng, David Eric Schwartz, Janos Veres, Aug 15, 2017
30. Printed electronic components on universally patterned substrate for integrated printed electronics, USPTO Patent No. 9629252 B2, Ping Mei, Tse Nga Ng, Gregory Whiting, April 18, 2017
31. Printable nanoparticle conductor ink with improved charge injection, USPTO Patent No. 9853230, Tse Nga Ng, P. Mei, Y. Wu, B. E. Abraham, December 26, 2017
32. Printed level sensor, USPTO Patent No. 9952082 B2, D. E. Schwartz, Y. Wang, R. A. Street, P Mei, J. Veres, G. L. Whiting, S. E. Ready, T. N. Ng, April 24, 2018, cited 12x
33. Sensors comprising palladium complex ink, USPTO Patent No. 10043605, T. N. Ng, S. Kor, Y. Wu, August 7, 2018

34. Printed double-wrapped coil on paper for projective capacitance sensing, USPTO Patent No. 9874984, P. Mei, T. N. Ng, J. Veres, January 23, 2018
35. Bare die integration with printed components on flexible substrate without laser cut, USPTO Patent No. 10165677 B2, P. Mei, T. N. Ng, B. S. Krusor, G. L. Whiting, S. E. Ready, J. Veres, December 25, 2018
36. Structural designs for stretchable, conformal electrical interconnects, USPTO Patent No. 10427397 B2, T. N. Ng, P. Mei, C. L. Cobb, S. E. Ready, J. S. Pashchkewitz, October 1, 2019
37. Sensor network system, USPTO Patent No. 10178447 B2, D. E. Schwartz, T. N. Ng, G. Whiting, A. Ganguli, G. Daniel, January 8, 2019
38. Memory circuit for reading ferroelectric memory having gain element including feedback capacitor, USPTO Patent No. 10229726 B2, D. E. Schwartz, T. N. Ng, P. Mei, March 12, 2019
39. Hypertonicity measuring device and method, USPTO Patent App# 20180125425 A1, Harinath Garudadri, Andrew Skalsky, Tse Nga Ng, Michael Yip, Leanne Chukoskie, notified that it is granted in May 2021
40. Infrared organic photodiode with an increased dielectric constant, USPTO Patent App# 2019126590 A1, Tse Nga Ng, Zhenghui Wu, pending.