

Yasser Khan

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Summary

Ph.D. candidate in electrical engineering and computer sciences with research interests in flexible and printed electronic systems. Currently, focusing on flexible bioelectronic and biophotonic sensors for wearable medical devices. Passionate about interdisciplinary projects that bridge engineering, materials science, and biology.

Research Interests

Wearable Electronics, Flexible Electronics, Printed Electronics, Medical Devices, Sensors.

Education

Ph.D. in Electrical Engineering and Computer Sciences University of California, Berkeley, CA, USA
GPA 3.95/4.00, Concentration: Physical Electronics. Dec '18
Thesis: Flexible hybrid electronics for wearable medical monitoring.
Advisor: [Professor Ana Arias](#).

M.S. in Electrical Engineering KAUST, KSA
GPA 3.92/4.00, Concentration: Optoelectronics and Photonics. Dec '12
Thesis: Light management in optoelectronic devices with disordered and chaotic structures.
Advisor: [Professor Boon Ooi](#); Co-Advisor: [Professor Andrea Fratalocchi](#).

B.S. in Electrical Engineering University of Texas at Dallas, TX, USA
GPA 3.98/4.00, Summa Cum Laude, Concentration: Electronics. May '10
Senior Design Project: Wireless embedded control system for atomically precise manufacturing.
Faculty Advisor: [Professor Murat Torlak](#); Industry Advisor: [John Randall, PhD](#).

Research Experience

Ph.D. Student University of California, Berkeley, CA, USA
Jul '13–Present

- [Printed biophotonic sensors for blood and tissue oximetry](#)
Demonstrated the first printed organic optoelectronic sensor for transmission-mode pulse oximetry [1]. Reported a reflection-mode organic oximeter probe for pulse oximetry on the wrist [6]. Additionally, demonstrated a flexible reflectance oximeter array capable of 2D oxygenation mapping of tissue [11].
- [Printed bioelectronic sensors for BIA \(Bioimpedance Analysis\), ECG \(Electrocardiography\), and EMG \(Electromyography\)](#)
Developed a fabrication process for producing thin printed flexible electrode arrays that non-invasively maps pressure-induced tissue damage, even when such damage cannot be visually observed. Also utilized the array for BIA, ECG, and EMG [4, 5, 13].
- [Integration of printed sensors to flexible hybrid electronics for wearable health monitoring](#)
Developed a wearable sensor patch composed of inkjet-printed gold ECG electrodes and a stencil-printed nickel oxide thermistor to record ECG and human body temperature [2].
- [Other Responsibilities: Designing and maintaining the group website: \[arias.berkeley.edu\]\(http://arias.berkeley.edu\).](#)

Advisor: [Professor Ana Arias](#).

Research Intern University of California, Berkeley, CA, USA
Oct '12–Jun '13

- [Printed optoelectronic probe for pulse oximetry](#)
Developed hardware and software for interfacing conventional electronics with OLEDs and OPDs for measuring blood oxygen saturation.

Advisor: [Professor Ana Arias](#).

Research Intern Oxford University, OX, UK
Jul '11–Aug '11

- [Enhancing light scattering and absorption in dye-sensitized solar cells \(DSSCs\) with air voids in \$TiO_2\$ nano-spheres](#)
With Mie theory and T-matrix formulation calculated scattering properties of air voids in TiO_2 nano-spheres. Optimized air void sizes and concentration for greater efficiencies in DSSCs.

Math Advisor: [James Kirkpatrick, PhD](#); Physics Advisor: [Professor Henry Snaith](#).

Graduate Student Researcher

KAUST, KSA

Sep '10–Jul '12

- [Energy harvesting in complex systems](#)
Experimentally investigated light trapping capabilities of deformed microstructures for energy harvesting [10].
- [ZnO nanorods for simultaneous light trapping and transparent electrode application in solar cells](#)
Studied light concentrating properties of ZnO nanorods, and at the same time evaluated those for using as transparent electrodes.
- [Electrochemical etching of tungsten tips for STM and AFM](#)
Etched ultra-sharp metallic tips for scanning probe microscopy. [9].
- [Other Responsibilities: Designing and maintaining the group website: \[photonics.kaust.edu.sa\]\(http://photonics.kaust.edu.sa\).](#)

Advisor: [Professor Boon Ooi](#); Co-Advisor: [Professor Andrea Fratallocchi](#).

Research Intern

Stanford University, CA, USA

Jul '10–Aug '10

- [Silver nanowire transparent electrodes for replacing existing ITO transparent electrodes in organic solar cells](#)
Worked on solution synthesis to produce $10\mu\text{m}$ length silver nanowires. Developed a Matlab tool to analyze the electrical response of silver nanowires, and wrote an image processing program for processing SEM images of nanowires.

MSE Advisor: [Professor Yi Cui](#); EE Advisor: [Professor Peter Peumans](#).

Hardware Design Intern

Zyvex Labs, TX, USA

Jan '10–Jun '10

- [Computer controlled electrochemical etcher to produce extremely sharp tips for use in scanning tunneling microscopy](#)
Developed hardware and software for an automated electrochemical tip etcher. Zyvex Labs commercialized the etcher as [Zetcher](#).

Advisor: [Joshua Ballard, PhD](#).

Publications

Please check [google scholar](#) for the most up-to-date publications list.

Journal Articles

- [1] Claire M. Lochner*, [Yasser Khan*](#), Adrien Pierre*, and Ana C. Arias. All-organic optoelectronic sensor for pulse oximetry. **Nature Communications**, 5(5745), 2014. doi: 10.1038/ncomms6745. *Equal contribution. Media Coverage:[UC Berkeley Grad News](#),[NSF Science 360 News](#),[UC Berkeley News Center](#),[Phys.org](#),
- [2] [Yasser Khan](#), Mohit Garg, Qiong Gui, Mark Schadt, Abhinav Gaikwad, Donggeon Han, Natasha A. D. Yamamoto, Paul Hart, Robert Welte, William Wilson, Steve Czarnecki, Mark Poliks, Zhanpeng Jin, Kanad Ghose, Frank Egitto, James Turner, and Ana C. Arias. Flexible hybrid electronics: Direct interfacing of soft and hard electronics for wearable health monitoring. **Advanced Functional Materials**, 26(47):8764–8775, 2016. ISSN 1616-3028. doi: 10.1002/adfm.201603763.
- [3] [Yasser Khan](#), Aminy E. Ostfeld, Claire M. Lochner, Adrien Pierre, and Ana C. Arias. Monitoring of vital signs with flexible and wearable medical devices. **Advanced Materials**, 28(22):4373–4395, 2016. ISSN 1521-4095. doi: 10.1002/adma.201504366.
- [4] [Yasser Khan](#), Felipe J. Pavinatto, Monica C. Lin, Amy Liao, Sarah L. Swisher, Kaylee Mann, Vivek Subramanian, Michel M. Maharbiz, and Ana C. Arias. Inkjet-printed flexible gold electrode arrays for bioelectronic interfaces. **Advanced Functional Materials**, 26(7):1004–1013, 2016. ISSN 1616-3028. doi: 10.1002/adfm.201503316. **Cover Article**.
- [5] Sarah L. Swisher, Monica C. Lin, Amy Liao, Elisabeth J. Leeflang, [Yasser Khan](#), Felipe J. Pavinatto, Kaylee Mann, Agne Naujokas, David Young, Shuvo Roy, Michael R. Harrison, Ana C. Arias, Vivek Subramanian, and Michel M. Maharbiz. Impedance sensing device enables early detection of pressure ulcers in vivo. **Nature Communications**, 6(6575), 2015. doi: 10.1038/ncomms7575. Media Coverage:[UC Berkeley News Center](#),[Futurity](#),[BBC News](#),and many more.

- [6] Donggeon Han, **Yasser Khan**, Jonathan Ting, Simon M. King, Nir Yaacobi-Gross, Martin J. Humphries, Christopher J. Newsome, and Ana C. Arias. Flexible blade-coated multicolor polymer light-emitting diodes for optoelectronic sensors. *Advanced Materials*, 29(22):1606206, 2017. ISSN 1521-4095. doi: 10.1002/adma.201606206.
- [7] Aminy E. Ostfeld, Abhinav M. Gaikwad, **Yasser Khan**, and Ana C. Arias. High-performance flexible energy storage and harvesting system for wearable electronics. *Scientific Reports*, 6(26122), 2016. ISSN 2045-2322. doi: 10.1038/srep26122.
- [8] Abhinav M. Gaikwad, **Yasser Khan**, Aminy E. Ostfeld, Shishir Pandya, Sameer Abraham, and Ana C. Arias. Identifying orthogonal solvents for solution processed organic transistors. *Organic Electronics*, 30:18–29, 2016. ISSN 1566-1199. doi: 10.1016/j.orgel.2015.12.008. **Solvents visualization program is available in the Downloads section: <http://arias.berkeley.edu/downloads/>.**
- [9] **Yasser Khan**, Hisham Al-Falih, Yaping Zhang, Tien Khee Ng, and Boon S. Ooi. Two-step controllable electrochemical etching of tungsten scanning probe microscopy tips. *Review of Scientific Instruments*, 83(6):063708, 2012. doi: 10.1063/1.4730045.
- [10] C. Liu, A. Di Falco, D. Molinari, **Y. Khan**, B. S. Ooi, T. F. Krauss, and A. Fratalocchi. Enhanced energy storage in chaotic optical resonators. *Nature Photonics*, 7:473–478, 2013. doi: 10.1038/nphoton.2013.108. **Cover Article. Media Coverage: [EurekAlert](#), [nanowerk](#), [Photonics.com](#), and many more.**
- [11] **Yasser Khan**, Donggeon Han, Adrien Pierre, Jonathan Ting, Xingchun Wang, Claire M. Lochner, and Ana C. Arias. Printed all-organic reflectance oximeter array. 2018. **In preparation.**
- [12] Natasha Yamamoto, Jonathan Ting, **Yasser Khan**, and Ana C. Arias. Screen-printed nickel oxide thermistor array. 2018. **In preparation.**
- [13] Ali Moin, Andy Zhou, Abbas Rahimi, Simone Benattiz, Alisha Menon, Senam Tamakloe, Jonathan Ting, Natasha Yamamoto, **Yasser Khan**, Fred Burghardt, Luca Beniniyz, Ana C. Arias, and Jan M. Rabaey. A brain-inspired emg gesture recognition system with flexible, high-density sensors and high-dimensional classifier. 2018. **In preparation.**
- [14] Leeya Engela, Chengming Liu, Nofar Mintz, **Yasser Khan**, Ana Arias, Yosi Shacham-Diamand, Slava Krylov, and Liwei Lin. Local electrical control of hydrogel microactuators in microfluidics. 2018. **Submitted to Sensors and Actuators B: Chemical.**

Conference Proceedings

- [1] **Yasser Khan**, Donggeon Han, Adrien Pierre, Jonathan Ting, Xingchun Wang, Claire M. Lochner, and Ana C. Arias. System design for flexible all-organic reflectance oximeter. In *MRS Spring Meeting, Phoenix, AZ, USA*, 2018.
- [2] Donggeon Han, **Yasser Khan**, Karthik Gopalan, and Ana C. Arias. Emission area patterning of blade-coated organic light-emitting diodes (oleds) via printed dielectrics. In *MRS Spring Meeting, Phoenix, AZ, USA*, 2018.
- [3] Ali Moin, Andy Zhou, Abbas Rahimi, Simone Benattiz, Alisha Menon, Senam Tamakloe, Jonathan Ting, Natasha Yamamoto, **Yasser Khan**, Fred Burghardt, Luca Beniniyz, Ana C. Arias, and Jan M. Rabaey. A brain-inspired emg gesture recognition system with flexible, high-density sensors and high-dimensional classifier. In *IEEE International Symposium on Circuits and Systems (ISCAS), Florence, Italy*, 2018.
- [4] Mark Poliks, James Turner, Kanad Ghose, Zhanpeng Jin, Mohit Garg, Qiong Gui, Ana Arias, **Yasser Khan**, Mark Schadt, and Frank Egitto. A wearable flexible hybrid electronics ecg monitor. In *Electronic Components and Technology Conference (ECTC), 2016 IEEE 66th*, pages 1623–1631. IEEE, 2016.
- [5] **Y. Khan** and A. C. Arias. Flexible electrode arrays for bioelectronic interfaces. In *Flexible and Printed Electronics Conference, CA, USA*, 2016.
- [6] **Yasser Khan**, Mark Schadt, Mohit Garg, Qiong Gui, Paul Hart, Robert Welte, Stephen Cain, Bill Wilson, Zhanpeng Jin, Mark Poliks, Kanad Ghose, Steve Czarnecki, Frank Egitto, James Turner, and Ana Claudia Arias. Inkjet-printed sensors for wearable health monitoring. In *MRS Fall Meeting, Boston, MA, USA*, 2015. **Best Oral Presentation Award.**

- [7] **Yasser Khan**, Claire M. Lochner, Adrien Pierre, and Ana C. Arias. System design for organic pulse oximeter. In *Advances in Sensors and Interfaces (IWASI), 2015 6th IEEE International Workshop on*, pages 83–86. IEEE, 2015. doi: 10.1109/IWASI.2015.7184975.
- [8] **Y. Khan**, M. Garg, M. Schadt, Q. Gui, P. Hart, Z. Jin, M. Poliks, R. Welte, S. Czarnecki, F. Egitto, K. Ghose, J. Turner, and A. C. Arias. Interfacing printed sensors to conventional electronics for wearable sensor patch. In *Flexible and Printed Electronics Conference, CA, USA, 2015*.
- [9] Amy Liao, Monica C Lin, Lauren C Ritz, Sarah L Swisher, David Ni, Kaylee Mann, **Yasser Khan**, Shuvo Roy, Michael R Harrison, Ana C Arias, and others. Impedance sensing device for monitoring ulcer healing in human patients. In *Engineering in Medicine and Biology Society (EMBC), 2015 37th Annual International Conference of the IEEE*, pages 5130–5133. IEEE, 2015.
- [10] **Yasser Khan**, Adrien Pierre, Claire Lochner, and Ana C. Arias. All-organic green light pulse oximeter for wearable medical sensing. In *MRS Fall Meeting, Boston, MA, USA, 2014*.
- [11] **Y. Khan**, Y. Zhang, M. Amin, A. Bayraktaroglu, T.K. Ng, H. Bagci, J. Phillips, and B.S. Ooi. ZnO nanorods for simultaneous light trapping and transparent electrode application in solar cells. In *Photonics Conference (PHO), 2011 IEEE*, pages 619–620. IEEE, 2011. doi: 10.1109/PHO.2011.6110700.
- [12] H. Al-Falih, **Yasser Khan**, Yaping Zhang, Damain Pablo San-Roman-Alerigi, Dongkyu Cha, Boon Siew Ooi, and Tien Khee Ng. Fabrication of tuning-fork based afm and stm tungsten probe. In *High Capacity Optical Networks and Enabling Technologies (HONET), 2011*, pages 190–192. IEEE, 2011. doi: 10.1109/HONET.2011.6149815.
- [13] **Yasser Khan**, Josh Ballard, Yaping Zhang, Justin Alexander, Miles Larkin, and Boon Ooi. Facile method for fabricating reproducible tungsten probe tips with varying cone angles. In *International Conference on Materials for Advanced Technologies (ICMAT), 2011*.
- [14] **Y. Khan** and J. Randall. Wireless embedded control system for atomically precise manufacturing. In *Information Technology: New Generations (ITNG), 2011 Eighth International Conference on*, pages 965–969. IEEE, 2011. doi: 10.1109/ITNG.2011.165.

Poster Presentations

- [1] **Yasser Khan**, Felipe Pavinatto, and Ana Claudia Arias. Flexible printed circuit board for wearable physiological monitoring. In *MRS Spring Meeting, San Francisco, CA, USA, April 2014*. **Nominated for Best Poster Award**.
- [2] **Yasser Khan**, Adrien Pierre, Claire Lochner, and Ana Claudia Arias. Printed pulse oximeter for wearable medical sensor patch. In *NASCENT IAB Meeting, Austin, TX, USA, January 2014*. **Best Poster Award**.
- [3] **Yasser Khan**, Changxu Liu, Diego Molinari, Boon Ooi, and Andrea Fratolocchi. Energy harvesting in complex systems. In *Electrical Engineering Days, King Abdullah University of Science and Technology*, February 2012. **Best Poster Award**.
- [4] **Yasser Khan**, Josh Ballard, Justin Alexander, Miles Larkin, and Boon Ooi. Controllable electrochemical etching of tungsten stm tips. In *First WEP Research Poster Session, King Abdullah University of Science and Technology*, January 2011. **Best Poster Award**.
- [5] **Yasser Khan**, Yaping Zhang, Muhammad Amin, Tien Khee Ng, Jamie Phillips, Hakan Bagci, and Boon Ooi. ZnO nanorods for simultaneous light trapping and transparent electrode application in solar cells. In *First Graduate Research Symposium, King Abdullah University of Science and Technology*, May 2011. **Best Poster Award**.

Patents

- [1] Ana Claudia Arias, Claire Lochner, Adrien Pierre, and **Yasser Khan**. Reflectance based pulse oximetry systems and methods, jan 24 2017. US Patent App. 15/414,397.

- [2] Michel Maharbiz, Vivek Subramanian, Ana Claudia Arias, Sarah Swisher, Amy Liao, Monica Lin, Felipe Pavinatto, **Yasser Khan**, Daniel Cohen, Elisabeth Leeflang, and others. Methods and apparatus for monitoring wound healing using impedance spectroscopy, dec 14 2016. US Patent App. 15/379,220.
- [3] Claire Meyer Lochner, Rachel Nancollas, Jacob Sadie, **Yasser Khan**, Ana Claudia Arias, and Adrien Pierre. Flexible, non-invasive real-time hematoma monitoring system using near-infrared spectroscopy, dec 29 2016. US Patent App. PCT/US2016/039406.

Successful Coauthored Grant Applications

- o \$700,000 funding from NextFlex, America's Flexible Hybrid Electronics (FHE) Manufacturing Institute for a project proposed by UC Berkeley, UCSD, and Jabil Circuits to develop "Integration Processes for Flexible and Wearable Wound Monitoring and Therapeutic Bandage" *2017–2018*
- o \$375,000 funding from Intel Corporation via. Semiconductor Research Corporation Grant No. 2014-IN-2571 for a project proposed by UC Berkeley to develop "Printable and Flexible Electronics for Wearable System Integration" *2015–2017*
- o \$425,000 funding from Nano-Bio Manufacturing Consortium (NBMC), an industry-academia partnership with the United States Air Force Research Laboratory (AFRL), for a project proposed by Binghamton University, University of California, Berkeley, and electronics packaging firm i3 Electronics, Inc. (Endicott, N.Y.) to develop "Electronics and Biometric Sensor Platforms for Human Performance Monitoring (HPM)" *2014–2015*

Honors and Distinctions

Research Awards / Honors:

Best Oral Presentation Award, MRS Fall Meeting, Boston, MA, USA	<i>Dec '15</i>
Best Poster Award, NASCENT IAB Meeting, UT Austin, TX, USA	<i>Jan '14</i>
Best Poster Award, EE – Photonics Track, Electrical Engineering Days, KAUST	<i>Feb '12</i>
Finalist, DOW Sustainability Innovation Student Challenge	<i>Sep '11</i>
Best Poster Award, First Graduate Research Symposium, KAUST	<i>May '11</i>
Best Poster Award, Winter Enrichment Period Research Poster Session, KAUST	<i>Jan '11</i>

Academic Awards / Honors:

EECS Departmental Fellowship, UC Berkeley	<i>Sep '13</i>
Academic Excellence Award, (Top 5% in Graduating Class), KAUST	<i>Dec '11</i>
KAUST Provost Award, (Top 15% in Matriculating Class), KAUST	<i>Nov '10</i>
KAUST Graduate Fellowship	<i>May '10</i>
Phi Kappa Phi, Honor Society, (Top 10% in Graduating Class), UT Dallas	<i>May '10</i>
Dean's List, All Semesters, (Top 10% in Erik Jonsson School of ECS), UT Dallas	<i>May '10</i>
Golden Key Honor Society, (Top 15% in School of ECS), UT Dallas	<i>Dec '09</i>
KAUST Discovery Scholarship	<i>Oct '08</i>
Academic Excellence Scholarship, UT Dallas	<i>Apr '08</i>
Undergraduate Scholarship for three years, OIC	<i>May '05</i>
Merit Scholarships, Education Board, Government of Bangladesh, (Top 1% in Graduating Class)	<i>Dec '01, '03, '05</i>

Technical skills

Fabrication and Characterization:

Fabrication: Dimatix, Ceradrop, Screen Printing, Automatic Film Applicator.	Microscopy: SEM – FEI Quanta 600, Confocal Microscopy, AFM, TEM.
Optical Characterization: UV-Vis, Raman and PL – Horiba, Ellipsometry.	Electrical Characterization: Cascade, B1500A Semiconductor Device Parameter Analyzer.

Software Skills:

Programming: C/C++, Python, Matlab.	Open-Source: MEEP, LAMMPS, Paraview, MSTM, Voro++, \LaTeX , Git.
OS: Unix, Ubuntu, Windows.	Software Applications: Comsol, L-Edit, SEMulator3D.

Hardware Skills:

Prototyping and PCB: Eagle.

MCUs and MPUs: Arduino, Gumstix, MSP 430, Nordic nRF51.

Professional Activities

Ad Hoc Reviewer, Nature Journals	'14 – Present
Ad Hoc Reviewer, Proceedings of the National Academy of Sciences, PNAS	'15 – Present
Reviewer, American Institute of Physics (AIP) Journals	'10 – Present
Reviewer, Institute of Electrical and Electronics Engineers (IEEE) Journals	'13 – Present
Reviewer, Springer Journals	'11 – Present
Materials Research Society (MRS), Student Member	'13 – Present
Institute of Electrical and Electronics Engineers (IEEE), Student Member	'06 – '10
American Physical Society (APS), Student Member	'09 – '10

Relevant Graduate Courses

Semiconductor Devices: Integrated-Circuit Devices, Solid State Devices, Electronic and Optical Properties of Semiconductors.	Optoelectronics and Photonics: Semiconductor Optoelectronic Devices, Semiconductor Lasers and LEDs, Photonics, Advanced Topics in Wave Propagation.
Bioelectronics: Introductory Electronic Transducers Laboratory, Brain-Machine Interface Systems.	Biophotonics: Principles of Molecular and Cellular Biophotonics.

Teaching

Lab / Content TA, EE 16A, Designing Information Devices and Systems I, UC Berkeley	Fall '17
Lab / Content TA, EE 16A, Designing Information Devices and Systems I, UC Berkeley	Spring '17
Lab TA, EE 306, Electronic and Optical Properties of Semiconductors, KAUST	Fall '12

References

- o **Ana Arias**, PhD
Professor, Electrical Engineering and Computer Sciences, UC Berkeley.
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