

Nasir Alfaraj

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SUMMARY OF QUALIFICATIONS

1. Strong educational and laboratory training background in micro- and nanofabrication and cleanroom practices.
2. Skills to understand and define a problem and the desire to passionately learn new skills and share knowledge.
3. Effective written and verbal communication skills gained through technical report writing and presentations.
4. Committed to maintaining quality and efficiency and producing results above and beyond the expected.
5. Ability to work well within small and large teams and as an individual contributor.

EDUCATION

- Ph.D. Electrical Eng., **King Abdullah University of Science and Technology**, Thuwal, Saudi Arabia, Jun. 2019.
- M.S. Electrical Eng., **King Abdullah University of Science and Technology**, Thuwal, Saudi Arabia, Jun. 2015.
 - Master's thesis: *Reversibly Bistable Flexible Electronics* [[Link](#)]
- B.S. Electrical Eng., **Western Michigan University**, Kalamazoo, MI, United States, Apr. 2013.

PROFESSIONAL EXPERIENCE

I) Research Experience

- (1) Growth, fabrication and characterization of group III–nitride and oxide nanostructures
Photonics Laboratory
 - Fabrication of III–nitride and III–oxide deep-ultraviolet photodetectors, LEDs, and lasers diodes;
 - Fabrication and characterized visible and ultraviolet optoelectronic devices on metal/silicon; and
 - Investigated photoinduced thermodynamic effects on MBE-grown InGaN/GaN and AlGaIn nanowires.
- (2) Fabrication and characterization of flexible metal–oxide–semiconductor field-effect transistors (MOSFETs)
Integrated Nanotechnology Laboratory
 - Assessed the functional integrity of long-channel MOSFETs housed on a reversibly bistable platform; and
 - Characterized flexible high- κ /metal gate stack MOSFETs using HfO₂ gate material with TiN electrodes.
- (3) Design of antenna-integrated microwave low-noise amplifiers
Integrated Microwave Packaging Antennas and Circuits Technology Laboratory
 - Designed and fabricated an RF receiver using LDK circuit board plotter (PCB prototyping);
 - Studied the feasibility of an inkjet-printed SAW-based chipless RFID tag operating at 2.45 GHz; and
 - Utilized different microwave filter topologies to design RFID tags.
- (4) Piezoelectric generator fabrication project
KAUST Nanofabrication Laboratory
 - Designed, fabricated, and characterized piezoelectric generators for microscale energy harvesting.
- (5) Design of multistage analog CMOS amplifiers
Sensors Laboratory
 - Designed a three-stage CMOS amplifier (Gain: 66.8-dB, BW: 686 kHz) using Cadence Virtuoso;
 - Achieved power consumption of value 90% lower than the maximum allowable value; and
 - Achieved gain was 120% higher than the required minimum value.

II) Work Experience

- (1) Graduate research and teaching assistant
King Abdullah University of Science and Technology (KAUST)
 September 2015–present
 - Growth of group III–nitride nanostructures using molecular beam epitaxy.
 - Fabrication and characterization of ultraviolet light-emitting diodes and lasers.
 - Assisted with teaching a class (semiconductor device physics and engineering quantum mechanics).
- (2) Served as an expert and peer reviewer to referee journal articles, including contributions of agencies of the United States and European governments [[Publons Profile Link](#)]
 - *APL Materials* (American Institute of Physics, United States).
 - *Journal of Applied Physics* (American Institute of Physics, United States).
 - *Journal of Nanophotonics* (SPIE, United States).
 - *Journal of Physics D: Applied Physics* (IOP Publishing, United Kingdom).
 - *Microelectronics Journal* (Elsevier, The Netherlands)
 - *Nanotechnology* (IOP Publishing, United Kingdom).
 - *Optics Express* (The Optical Society, United States).
- (3) Research and application engineer intern
The Dow Chemical Company—Middle East and Africa R&D Center
 June 2014–September 2014 (4 months)
 - Evaluated the Dow Ultrafiltration technology performance with Red Sea water.
 - Analyzed and characterized polymer-based membranes using scanning electron microscopy (SEM).
 - Made conclusions and recommendations to further improve the UF operational performance.

JOURNAL PUBLICATIONS

1. **N. Alfaraj**,[†] J.-W. Min,[†] C. H. Kang, D. Priante, A. A. Alatawi, R. C. Subedi, M. Tangi, T. K. Ng, and B. S. Ooi, “Deep ultraviolet integrated photonic and optoelectronic devices: A prospect of the hybridization of group III–nitrides with two-dimensional materials,” *Journal of Semiconductors*, in press (2018)
Invited review paper.
[†]Equally contributing authors.
2. C. Zhao,[†] **N. Alfaraj**,[†] R. C. Subedi, J. W. Liang, A. A. Alatawi, A. A. Alhamoud, M. Ebaid, M. S. Alias, T. K. Ng, and B. S. Ooi, “III-nitride nanowires on unconventional substrates: From material to optoelectronic device applications,” *Progress in Quantum Electronics*, 61, 1–31 (2018) [[Link](#)]
[†]Equally contributing authors.
3. **N. Alfaraj**, S. Mitra, F. Wu, I. A. Ajia, B. Janjua, A. Prabaswara, R. A. Aljefri, H. Sun, T. K. Ng, B. S. Ooi, I. S. Roqan, and X. Li, “Photoinduced entropy of InGaN/GaN p-i-n double-heterostructure nanowires,” *Applied Physics Letters*, 110(16), 161110 (2017) [[Link](#)]
4. **N. Alfaraj**, M. M. Muhammed, K.-H. Li, B. Janjua, R. A. Aljefri, H. Sun, T. K. Ng, B. S. Ooi, I. S. Roqan, and X. Li, “Thermodynamic photoinduced disorder in AlGaIn nanowires,” *AIP Advances*, 7(12), 125113 (2017) [[Link](#)]
5. **N. Alfaraj**, A. M. Hussain, G. A. Torres Sevilla, M. T. Ghoneim, J. P. Rojas, A. B. Aljedaani, and M. M. Hussain, “Functional integrity of flexible n-channel metal–oxide–semiconductor field-effect transistors on a reversibly bistable platform,” *Applied Physics Letters*, 107(17), 174101 (2015) [[Link](#)]
Featured in 2015 APL Editors’ Picks list and selected as a journal cover and featured article.
6. D. Priante, M. Tangi, J.-W. Min, **N. Alfaraj**, J. W. Liang, H. Sun, H. H. Alhashim, X. Li, A. M. Albadri, A. Y. Alyamani, T. K. Ng, and B. S. Ooi, “Enhanced electro-optic performance of surface-treated nanowires: origin and mechanism of nanoscale current injection for reliable ultraviolet light-emitting diodes,” *Optical Materials Express*, in press (2018).
7. M. Tangi, J.-W. Min, D. Priante, R. C. Subedi, D. H. Anjum, A. Prabaswara, **N. Alfaraj**, J. W. Liang, M. K. Shakfa, T. K. Ng, and B. S. Ooi, “Observation of piezotronic and piezo-phototronic effects in n-InGaIn nanowires/Ti grown by molecular beam epitaxy,” *Nano Energy*, 54, 264–271 (2018) [[Link](#)]

8. W. G. Alheadary, K.-H. Park, **N. Alfaraj**, Y. Guo, E. Stegenburgs, T. K. Ng, B. S. Ooi, and M.-S. Alouini, "Free-space optical channel characterization and experimental validation in a coastal environment," *Optics Express*, 26(6), 6614 (2018) [[Link](#)]
9. H. Sun, F. Wu, T. M. Al tahtamouni, C.-H. Liao, W. Guo, **N. Alfaraj**, K.-H. Li, D. H. Anjum, T. Detchprohm, R. D. Dupuis, and X. Li, "Revealing microstructure and dislocation behavior in BAlN/AlGa_{0.72}N heterostructures," *Applied Physics Express*, 11(1), 011001 (2018) [[Link](#)]
10. H. Sun, F. Wu, Y. J. Park, T. M. Al tahtamouni, K.-H. Li, **N. Alfaraj**, T. Detchprohm, R. D. Dupuis, and X. Li, "Influence of TMAI preflow on AlN epitaxy on sapphire," *Applied Physics Letters*, 110(19), 192106 (2017) [[Link](#)]
11. H. Sun, F. Wu, Y. J. Park, T. M. Al tahtamouni, **N. Alfaraj**, K.-H. Li, T. Detchprohm, R. D. Dupuis, and X. Li, "Structural properties, crystal quality and growth modes of MOCVD-grown AlN with TMAI pretreatment of sapphire substrate," *Journal of Physics D: Applied Physics*, 30(39), 395101 (2017) [[Link](#)]
12. M. T. Ghoneim, **N. Alfaraj**, G. A. Torres-Sevilla, H. M. Fahad, and M. M. Hussain, "Out-of-plane strain effects on physically flexible FinFET CMOS," *IEEE Transactions on Electron Devices*, 63(7), 2657 (2016) [[Link](#)]
13. J. P. Rojas,[†] G. A. Torres Sevilla,[†] **N. Alfaraj**, M. T. Ghoneim, A. T. Kutbee, A. Sridharan, and M. M. Hussain, "Nonplanar nanoscale fin field effect transistors on textile, paper, wood, stone, and vinyl *via* soft material-enabled double-transfer printing," *ACS Nano*, 9(5), 5255 (2015). [[Link](#)]
[†]Equally contributing authors.
14. M. T. Ghoneim, H. M. Fahad, A. M. Hussain, J. P. Rojas, G. A. Torres Sevilla, **N. Alfaraj**, E. B. Lizardo, and M. M. Hussain, "Enhanced cooling in mono-crystalline ultra-thin silicon by embedded micro-air channels," *AIP Advances*, 5(12), 127115 (2015) [[Link](#)]

CONFERENCE PRESENTATIONS AND PUBLICATIONS

1. **N. Alfaraj**,^{†,*} Kuang-Hui Li,[†] Chun Hong Kang, Davide Priante, Laurentiu Braic, Zaibing Guo, Tien Khee Ng, Xiaohang Li, and Boon S. Ooi, "Electrical characterization of solar-blind deep-ultraviolet (Al_{0.28}Ga_{0.72})₂O₃ Schottky photodetectors grown on silicon by pulsed laser deposition," *Conference on Lasers and Electro-Optics (CLEO) 2019*, San Jose, CA, United States, May 2019 (submitted paper).
[†]Equally contributing authors.
^{*}Presenting author.
2. A. Alhamoud,[†] **N. Alfaraj**,^{†,*} D. Priante, B. Janjua, A. A. Alatawi, A. M. Albadri, A. Y. Alyamani, T. K. Ng, and B. S. Ooi, "Functional integrity and stable high-temperature operation of planarized ultraviolet-A Al_xGa_{1-x}N/Al_yGa_{1-y}N multiple-quantum-disk nanowire LEDs with charge-trapping inhibition interlayer," *SPIE Photonics West 2019*, San Francisco, CA, United States, February 2019.
[†]Equally contributing authors.
^{*}Presenting author.
3. **N. Alfaraj**, S. Mitra, F. Wu, I. A. Ajia, B. Janjua, A. Prabaswara, R. A. Aljefri, H. Sun, T. K. Ng, B. S. Ooi, I. S. Roqan, and X. Li, "Photoinduced thermodynamic behavior in InGa_{0.72}N/GaN double-heterostructure nanowires," *59th Electronic Material Conference (EMC)*, South Bend, IN, United States, May 2017.
4. **N. Alfaraj**, S. Mitra, F. Wu, I. A. Ajia, B. Janjua, A. Prabaswara, R. A. Aljefri, H. Sun, T. K. Ng, B. S. Ooi, I. S. Roqan, and X. Li, "Photoinduced thermodynamic behavior in InGa_{0.72}N/GaN double-heterostructure nanowires," *12th International Conference on Nitride Semiconductors (ICNS-12)*, Strasbourg, France, July 2017.
5. **N. Alfaraj**, R. A. Aljefri, M. Baier, D. Priante, B. Janjua, A. Prabaswara, T. K. Ng, B. S. Ooi, F. Laquai, and X. Li, "Effective surface passivation of InGa_{0.72}N/GaN nanowires studied by photoluminescence and photothermal deflection spectroscopy," *International Workshop on Nitride Semiconductors (IWN 2016)*, Orlando, FL, United States, October 2016.
6. R. Lin,[†] V. Mazzone,[†] Y. Wu, **N. Alfaraj**, K.-H. Li, H. Sun, X. Li, and A. Fratalocchi, "Hyperuniform structures for controllable localized random nano-laser," *SPIE Photonics West 2019*, San Francisco, CA, United States, February 2019.
[†]Equally contributing authors.

7. H. Sun, F. Wu, N. Alfaraj, T. Detchprohm, R. D. Dupuis, and X. Li, "Study of TMAI-induced carbon impurity on AlN film polarity and growth mode on sapphire," *12th International Conference on Nitride Semiconductors (ICNS-12)*, Strasbourg, France, July 2017.
8. H. Sun, F. Wu, T. M. Al tahtamouni, N. Alfaraj, T. Detchprohm, R. D. Dupuis, and X. Li, "Strain and compositional analysis of BAlN/Al(Ga)N structures for distributed Bragg reflector applications," *12th International Conference on Nitride Semiconductors (ICNS-12)*, Strasbourg, France, July 2017.
9. H. Sun, F. Wu, N. Alfaraj, T. Detchprohm, R. D. Dupuis, and X. Li, "Structural properties and growth modes of MOCVD-grown AlN with TMAI pretreatment of sapphire substrate," *59th Electronic Materials Conference (EMC 2017)*, South Bend, IN, United States, June 2017.
10. H. Sun, F. Wu, N. Alfaraj, T. Detchprohm, R. D. Dupuis, and X. Li, "Structural properties and growth modes of MOCVD-grown AlN with TMAI pretreatment of sapphire substrate," *59th Electronic Materials Conference (EMC 2017)*, South Bend, IN, United States, June 2017.
11. X. Li, K.-H. Li, N. Alfaraj, M. S. Alias, T. K. Ng, B. S. Ooi, T. Detchprohm, and R. D. Dupuis, "BAlN refractive index and UV distributed bragg reflectors," *18th International Conference on Metalorganic Vapor Phase Epitaxy (ICMOVPE)*, San Diego, CA, United States, July 2016.
12. M. T. Ghoneim, N. Alfaraj, G. A. Torres Sevilla and M. M. Hussain, "Ultra-high density out-of-plane strain sensor 3D architecture based on sub-20 nm PMOS FinFET," *15th International Conference on Nanotechnology (IEEE NANO 2015)*, Rome, Italy, 27-30 July, 2015. [[Link](#)]
13. M. T. Ghoneim, N. Alfaraj, G. A. Torres Sevilla, H. M. Fahad, and M. M. Hussain, "Out-of-plane strain effect on silicon-based flexible FinFETs," *73rd Annual Device Research Conference (DRC)*, The Ohio State University, Columbus, Ohio, USA, June 21-24, 2015. [[Link](#)]

TECHNICAL AND COMPUTER SKILLS

1. Software skills

Python, L^AT_EX, C, MATLAB, Cadence Virtuoso, ANSYS HFSS, Agilent ADS, L-Edit, OriginLab, IntelliSuite.

2. Device fabrication and characterization skills

Molecular beam epitaxy, pulsed laser deposition, atomic layer deposition, plasma-enhanced chemical vapor deposition, electron-beam physical vapor deposition, reactive-ion etching, atomic force microscopy, scanning electron microscopy, transmission electron microscopy, secondary ion mass spectrometry, X-ray photoelectron spectroscopy, X-ray diffraction, nuclear magnetic resonance, photoluminescence and Raman measurements, ultraviolet-visible spectroscopy.

PROFESSIONAL MEMBERSHIPS

1. American Chemical Society.
2. Institute of Electrical and Electronics Engineers (IEEE).
3. IEEE Young Professionals.
4. The Optical Society.
5. SPIE.

SERVICE, AWARDS AND RECOGNITIONS

1. Invited judge: Served as a scientific report and presentation grader for the Saudi Research Science Institute (SRSI).
2. Represented KAUST and Saudi Arabia in the 2018 Chicago Forum on Global Cities, hosted by the *Chicago Council on Global Affairs* and *Financial Times*, 2018 [[Link](#)]
3. Featured as a scientist in a book chapter published by the Royal Society of Chemistry, United Kingdom (*Nanotechnology: The Future is Tiny, Ch. 1: Generating Energy Becomes Personal*, August 2016) [[Link](#)].
4. Editor's Select (2015), Applied Physics Letters, 2016.
5. Best of the Featured Articles of 2015, Applied Physics Letters, 2016.

6. Saudi Arabian Cultural Mission to the US Academic Awards (2008–2013).
7. King Abdullah Foreign Scholarship Program (2008–2013).
8. Inducted into the following honor societies in the United States:
 - Pi Mu Epsilon, Honorary National Mathematics Society, 2012*
 - Tau Beta Pi, Engineering Honors Society, 2011*
 - Eta Kappa Nu, Electrical and Computer Engineering Honor Society of the IEEE, 2010*
9. Acknowledged by the Saudi Arabian Cultural Mission in Washington, D.C., 2011.
Awarded a certificate of Appreciation for outstanding performance as a member of the Saudi Student Association.
10. The Western Edge Retention Scholarship, 2008.
Retention scholarship for academically successful freshmen.

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