ARWA SAUD ABDULLAH ABBAS

Materials Scientist

arwasaud@hotmail.com

EDUCATION

Doctor of Philosophy (PhD), Materials
University of California, Santa Barbara, United States of America (01/2015-03/2020)
Advisors: Profs. Steven Denbaars **&** Shuji Nakamura
Prof. Nakamura- **Nobel Laureate in Physics 2014.**
PhD Dissertation: Optical Modeling, MOCVD Growth,
and Development of Novel Fabrication Technologies
for Semi-Polar ($20\bar{2}1$) GaN Flip-Chip
Edge Emitting Lasers Structures.

Master of Applied Science in Mechanical Engineering (Nanofabrication) (09/2011-08/2013)
University of Waterloo, Canada
Advisers: Profs. Mustafa Yavuz **&** Bo Cui
Master Thesis: Nanofabrication Using Electron Beam Lithography:
Novel Resist and Applications

Advance English Language for professionals
Renison English Language Institute (01/2011-07/2011)
in Waterloo, Canada
Canadian Language Learning College (CLLC) in Ottawa, Canada (06/2010-12/2010)

Working Co-operator in Physics Department
at Jazan University (10/2008-07/2009)
Volunteer work
at Jazan University Library

Bachelor of Science and Education in Physics (07/2003-09/2007)
Department of Physics
Jazan University, Kingdom Saudi Arabia

LANGUAGES:

- English – fluent.
- Russian – pre-intermediate level.
- Arabic-native.
- Hebrew Vocabulary **Enhancing** –Program
- Interested in German, Japanese and Chinese languages.

EXPERTISE & TECHNICAL SKILLS

a) MATERIALS GROWTH TECHNIQUES & b) FABRICATION TECHNIQUES & c) CHARACTERIZATION TECHNIQUES & d) LASER DIODES (LDs) PROCESSING & e) SOFTWARE & MODELING SKILLS

- Around 10 years of cleanroom research experience in Nanostructure and Laser Device fabrication and characterization, and more than 5 years of Epitaxial Growth research experience. Mathematica, FIMMWAVE/FIMMPROP for simulation cladding layers (CLs) and waveguides (WGs), Microsoft Office, Python, Origin, Mask design (L-Edit and KLayout).

ARWA SAUD ABDULLAH ABBAS, PHD

RESEARCH/WORK EXPERIENCE & PROFESSIONAL ACTIVITIES:

September 2024 - Present: King Abdulaziz City for Science and Technology (KACST), and the Microelectronics and Semiconductors Institute, Energy and Industry Sector in Riyadh, Saudi Arabia, Senior Researcher.

June 2023-2024: Ioffe Physical-Technical Institute of the Russian Academy of Science, and Centre nano-heterostructure physics in St. Petersburg, Russian Federation, MBE reactor and research on semiconductor opto-electronic devices, Visiting Scientist (Invitation)

October 2020-September 2024: King Abdulaziz City for Science and Technology (KACST), and the National Center for Nanotechnology and Advanced Materials, Materials Science Research Institute in Riyadh, Saudi Arabia, Assistant Research Professor

Jan 2014- October 2020: King Abdulaziz City for Science and Technology (KACST), and the National Center for Nanotechnology and Advanced Materials in Riyadh, Saudi Arabia, Researcher.

2015-2019: UCSB Materials, Nakamura and DenBaars Laboratories, Graduate Student Researcher.

Spring 2018: University of California, Santa Barbara (UCSB), Graduate Teaching Assistant
MATRL227: METAL-ORGANIC CVD.
Supervisor: Prof. Steven Denbaars

Mar 2014-Dec 2014: King Abdulaziz City for Science and Technology (KACST), and the National Center for Nanotechnology (NCN) & National joint projects between KACST and KAUST on Solid State Lighting, Researcher.

PUBLICATIONS:

[P16] **Arwa Saud Abbas**. "Scientific explanation of e^+ and Weyl fermion for injecting semiconductor devices.", Frontiers in Electronics, 5:1372631. https://doi:10.3389/felec.2024.1372631.

[P15] **Arwa Saud Abbas**. "Describing e^+ and Weyl fermion as beam/current for pump/injection semiconductor devices." APL Energy 2, 030901 (2024) 1-10. https://doi.org/10.1063/5.0203238.

[P14] Valentin Jmerik, Alexey Semenov, Dmitriy Nechaev, Sergey Troshkov, Darya Sakhno, Prohor Alekseev, Demid Kirilenko, Ilya Eliseyev, Valery Davydov, and **Arwa Saud Abbas,** "Low-defect and stress-free AlN nanoprisms and microrods selectively grown on micro-patterned c-sapphire substrate by plasma-assisted molecular beam epitaxy", Appl. Phys. Lett. 124, 232104 (2024), https://doi.org/10.1063/5.0216809.

[P13] Semenov, Alexey N., Dmitii V. Nechayev, Sergei I. Troshkov, Darya S. Berezina, **Abbas Arwa Saud**, and Valentin N. Jmerik. "GaN micro- and nanostructures selectively grown on profiled sapphire substrates using PA-MBE without lithography." Condensed Matter and Interphases 25, no. 4 (2023): 532-541.

[P12] **Arwa Saud Abbas** et al., "Fabrication Method of Carbon-based Materials in CH_4/N_2 Plasma by RF-PECVD and Annealing Treatment for Laser Diodes", Adv. Nan. Res., vol. 6, no. 1, pp. 29–43, (2023). https://doi: https://doi.org/10.21467/anr.6.1.29-43.

[P11] **Arwa Saud Abbas**, Ultrawide-bandgap semiconductor of carbon-based materials for meta-photonics-heterostructure, lasers, and holographic displays. AAPPS Bull. 33, 4 (2023). https://doi.org/10.1007/s43673-022-00073-0

[P10] **Arwa Saud Abbas,** Alyamani, A., Nakamura, S., Denbaars, S., Damage-free substrate removal technique: wet undercut etching of semipolar (20-21) laser structures by incorporation of un/relaxed sacrificial layer single quantum well, (2021) Japanese Journal of Applied Physics: JJAP-103323, https://doi.org/10.35848/1347-4065/abf36d

[P9] **Arwa Saud Abbas,** PhD Dissertation, Optical Modeling, MOCVD Growth, and Development of Novel Fabrication Technologies for Semi-Polar (20-21) GaN Flip-Chip Edge Emitting Lasers Structures, University of California, Santa Barbara, ProQuest, March (2020).

[P8] **Arwa Saud Abbas,** Alyamani, A., Nakamura, S., Denbaars, S., (2019) Enhancement of n-type GaN (20-21) semipolar surface morphology in photo-electrochemical undercut etching. Appl. Phys. Express, 12 036503. https://doi.org/10.7567/1882-0786/ab028d

[P7] Becerra, D., Kuritzky, L., Nedy, J., **Arwa Saud Abbas,** Pourhashemi, A., & Farrell, R. et al. (2016). Measurement and analysis of internal loss and injection efficiency for continuous-wave blue semipolar (20-2-1) III-nitride laser diodes with chemically assisted ion beam etched facets. Applied Physics Letters, 108(9), 091106. http://dx.doi.org/10.1063/1.4943143

[P6] Kuritzky, L., Becerra, D., **Arwa Saud Abbas,** Nedy, J., Nakamura, S., DenBaars, S., & Cohen, D. (2016). Chemically assisted ion beam etching of laser diode facets on nonpolar and semipolar orientations of GaN. Semiconductor Science and Technology, 31(7), 075008. http://dx.doi.org/10.1088/0268-1242/31/7/075008

[P5] **Arwa Saud Abbas,** Alqarni, S., Shokouhi, B., Yavuz, M., & Cui, B. (2014). Water soluble and metal-containing electron beam resist poly(sodium 4-styrenesulfonate). Materials Research Express, 1(4), 045102. http://dx.doi.org/10.1088/2053-1591/1/4/045102

[P4] **Arwa Saud Abbas,** Yavuz, M., & Cui, B. (2014). Metal and organic nanostructure fabrication by electron beam lithography and dry liftoff Nanotechnology (IEEE-NANO), 2014 IEEE 14th International Conference on 10.1109/NANO.2014.6968083

[P3] **Arwa Saud Abbas,** Yavuz, M., & Cui, B. (2014). Polycarbonate electron beam resist using solvent developer. Microelectronic Engineering, 113, 140-142. http://dx.doi.org/10.1016/j.mee.2013.08.

[P2] Con, C., **Arwa Saud Abbas,** Yavuz, M., & Cui, B. (2013). Dry thermal development of negative electron beam resist polystyrene. Advances In Nano Research, 1(2), 105-109. http://dx.doi.org/10.12989/anr.2013.1.2.105.

[P1] **Arwa Saud Abbas,** MASc thesis, Nanofabrication Using Electron Beam Lithography: Novel Resist and Applications, University of Waterloo, ProQuest, August (2013).

CITATIONS:

Scholar Google

PATENT:

[PA1] **Arwa Saud Abbas**, Jared Kearns, and Steven P. DenBaars. "Enhancement of semipolar n–type GaN surface morphology in Photo–Electrochemical Undercut Etching," Patent UC 2019–177–1; G&C 30794.0701USP1. Filed on November 7, (2018)
[PA2] **Arwa Saud Abbas**, THE FIRST ATTEMPT DESCRIPTING OF E+ AND WEYL FERMION AS BEAM/CURRENT FOR PUMP/INJECTION SEMICONDUCTOR DEVICES, Patent PCT/SA2024/050002. Filed on Feb (2024), WO2025122033 (A1).
[PA3] **Arwa Saud Abbas**, et al., (2025). Method for preparing thin carbon layer by plasma enhanced chemical vapor deposition. SA123447276 (B1). King Abdulaziz City for Science & Technology.
[PA4] **Arwa Saud Abbas**, A. S. (2025). Diode laser device based on carbon material. SA123447285 (B1). King Abdulaziz City for Science & Technology.

CONFERENCE PRESENTATIONS & POSTERS & WORKSHOPS:

[12] **Arwa Saud Abbas,** Dmitrii R. Kazanov, Valentin Jmerik, et al., May 2024 – Nanolithography-free technology of low-defect and stress-free AlN nanoprisms, nano/micro-columns or rods selectively grown on micro-patterned c-sapphire substrate by PA-MBE for UVC-lasers arrays, May 2024, 1st Open BRICS Smart Materials and Devices Conference 2024, Shenzhen, China (Presented talk)
[11] **Arwa Saud Abbas,** A. Alyamani, S. Nakamura, S. Denbaars, September 2021 – Substrate removal technique in wet undercut etching of semi-polar (20-21) InGaN laser structures by the incorporation of un/relaxed sacrificial layer single quantum well, 47th International Conference on Micro and Nano Engineering, Turin, Italy. (Poster)
[10] **Arwa Saud Abbas**, November 10, 2020 – High Power Semi-polar LDs for smart lighting at Recent advances in GaN solid state lighting and their applications KACST-UCSB virtual workshop. (Presented talk)
[9] **Arwa Saud Abbas**, P. Chan, C. Pynn, T. Kamikawa, D. L Becerra, J. Speck, S Nakamura, S DenBaars and D. Cohen Simulation, Growth, and Fabrication of TCO/Dielectric cladding green Semipolar III-nitride Laser, SSLEEC 2017, Santa Barbra, CA, US. (Poster)
[8] **Arwa Saud Abbas**, M.S. Alias, T.K. Ng, Y. Yang, M.M El-Desouki and B.S. Ooi Metallic-Dielectric Nano-Grating for Efficient Visible LED Light Extraction Compound Semiconductors Week 2015, Santa Barbra, CA, US. (Poster)
[7] **Arwa Saud Abbas**, S. Alqarni, Babak B. Shokouhi, M. Yavuz and B. Cui. August 2014 – Metal and Organic Nanostructure Fabrication by Electron Beam Lithography and Dry Liftoff. The 14th IEEE International Conference on Nanotechnology, Toronto, ON, Canada. (Poster)
[6] **Arwa Saud Abbas**, S. Alqarni, M. Yavuz and B. Cui. May 2014 – Water Soluble and Developable e-Beam Resist Sodium PSS, EIPBN 58th International Conference on Electron, Ion and Photon Beam and Nanofabrication, Washington DC, US. (Presented talk)
[5] **Arwa Saud Abbas**, S. Alqarni, M. Yavuz and B. Cui. May 2014 – Organic and Metallic Nanostructure Fabrication by Electron Beam Lithography and Dry Liftoff. EIPBN, 58th International Conference on Electron, Ion and Photon Beam and Nanofabrication, Washington DC, US. (Presented talk)
[4] **Arwa Saud Abbas**, M. Yavuz and B. Cui. September 2013 – Water soluble and developable Electron Beam Resist PSS. 39th International Conference on Micro and Nano Engineering, London, UK. (Poster)
[3] **Arwa Saud Abbas**, M. Yavuz and B. Cui. September 2013 – Metal Nanostructure Fabrication by Electron Beam Lithography and Dry Liftoff. 39th International Conference on Micro and Nano Engineering, London, UK. (Poster)
[2] **Arwa Saud Abbas**, M. Yavuz and B. Cui. May 2013 – Polycarbonate as an ideal grayscale Electron Beam Resist using diluted Cyclopentanone Developer. EIPBN, 57th International Conference on Electron, Ion and Photon Beam and Nanofabrication, Nashville, Tennessee. (Poster)
[1] C. Con, **Arwa Saud Abbas**, M. Yavuz and B. Cui. May 2012 – Dry Thermal Development of Negative Electron Beam Resist Poly styrene. EIPBN, 56th International Conference on Electron, Ion and Photon Beam and Nanofabrication, Waikoloa, Hawaii. (Poster)

PARTICIPATING IN THE MANUSCRIPT PEER REVIEW PROCESS:
Peer review activities (> 27 reviews for 16 publications) (https://orcid.org/0000-0003-3282-2255)

[R16] Materials Research Express: MRX-131123
[R15] Journal of Physics D: Applied Physics: JPhysD-140033
[R14] Materials Research Express: MRX-129942.
[R13] Physica Scripta: PHYSSCR-131653.
[R12] Semiconductor Science and Technology: SST-110044.
[R11] Participation in Reviewing: Jmerik, Valentin, Vladimir Kozlovsky, and Xinqiang Wang. 2023. "Electron-Beam-Pumped UVC Emitters Based on an (Al,Ga)N Material System" Nanomaterials 13, no. 14: 2080. https://doi.org/10.3390/nano13142080.
Acknowledged: for help in preparing the manuscript.
[R10] Nanotechnology: NANO-134910
[R9] New Journal of Physics: NJP-115682
[R8] JVST B: Journal of Vacuum Science and Technology: JVB23-AR-00008-TR
[R7] Nanotechnology: NANO-134553
[R6] Review activity for Journal of vacuum science and technology: Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures, ISSN: 2166-2754.
[R5] Nanotechnology: NANO-130815.
[R4] Semiconductor Science and Technology: SST-108148.

[R3] Nanotechnology: NANO-131457.
[R2] JVST B: Journal of Vacuum Science and Technology: JVB22-AR-00012
[R1] Journal of Micromechanics and Microengineering: JMM-105697