

Ayman Z. Rezk

Contact

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127788, Abu Dhabi, UAE

Highly skilled Semiconductor Scientist with over a decade of expertise in clean room environments. Proficient in operating a wide range of cleanroom equipment, characterizing fabricated devices, and conducting data analysis.

Eager to pursue opportunities in the field of Micro & Nanoelectronics fabrication to further hone my skills and make significant contributions to the advancement of technologies, such as extending Moore's law, TFDs, NVMs, FEOL and Technology-CAD.

Education

Jan 2014 – May 2018

Ph.D., Microsystems Engineering

Masdar Institute, UAE in collaboration with Massachusetts Institute of Technology, US
Optimization of Al doped ZnO thin films for flexible TFTs and Piezoelectric Sensors

Sep 2010 – May 2012

M.Sc., Microsystems Engineering

Masdar Institute, UAE in collaboration with Massachusetts Institute of Technology, US
Low Power Memory Design

Sep 2005 – Jun 2009

B.Sc., Electronics and Communication

Tanta Faculty of Engineering, Egypt
Open-Source Radio Frequency Identification (RFID) Project

Experience

Nov 2019 – Present

Postdoctoral Fellowship, Khalifa University for Science & Technology, UAE

- SPM and Spectrometry
- Semiconductor nanoparticles
- 2D Materials
- Nano Non-volatile Memories
- Optical devices

Oct 2018 – Nov 2019

Research Associate, Khalifa University for Science & Technology, UAE

- Kelvin Probe Force Microscopy, Conductive-AFM and Electrostatic Force Microscopy
- Metallic nanoparticles
- Nano Non-volatile Memories

Sep 2010 – May 2018

Research Assistant, Masdar Institute for Science & Technology, UAE

- Deposition methods (ALD, PECVD, MOCVD, Sputtering, Thermal and E-Beam Evaporation)
- Lithography techniques (EBL, Wet and RIE Etch)
- Spectroscopy and Microscopy (SEM, AFM, TEM, XRD, W/EDS and Raman)
- Fabrication and TCAD Modeling of state-of-the-art 1D and 2D structures using new materials for thin film nonvolatile memory structures with nanoparticles & ultrathin trapping layers in collaboration with UNAM, Ankara University, Turkey
- TCAD Modeling of fast switching/memory devices using Si nanowires and solar cell with embedded quantum dots
- Growing doped ZnO thin films using atomic layer deposition. Characterizing them using XRD, Raman, SEM, AFM, PFM, four-point probe resistivity and hall effect measurements.
- Demonstrating thin film transistors grown on flexible and transparent substrate using the doped ZnO films. Fabricating devices with various doping levels and growth conditions and optimizing their mobility, On-Off current ratio and threshold voltage
- Investigating the piezoresponse of doped ZnO thin films for strain sensing applications. Fabricating and characterizing a proof-of-concept strain sensor

Sep 2010 – May 2016

Teaching Assistant, Masdar Institute for Science & Technology, UAE

- Advanced Integrated Circuits Technology
- Microelectronics Devices and Circuits
- Integrated Microelectronics Devices
- Technology Computer-aided design (TCAD)

Jun 2009 – Sep 2010

Teaching Assistant, Tanta University, Faculty of Engineering, Egypt

- Complementary metal oxide semiconductor
- Electrical and Electronic Materials
- Very large-scale integration

Publications

Artificial Visual Perception Neural System Using a Solution-Processable MoS₂ In-Memory Light Sensor [Article]

Kumar, D.; Joharji, L.; Li, H.; Rezk, A.; Nayfeh, A.; El-Atab, N.

Light: Science & Applications, 12 (1), 109, May 2023. DOI: 10.1038/s41377-023-01166-7

Utilizing Trapped Charge at Bilayer 2D MoS₂/SiO₂ Interface for Memory Applications [Article]

Rezk, A.; Alnaqbi, W.; Alhammadi, A.; Nayfeh, A.

IOP Nanotechnology, 33, 275201, April 2022. DOI: 10.1088/1361-6528/ac61cd

Tunable plasmon-polarizmon resonance and hotspots in metal-silicon core-shell nanostructures [Article]

Nayfeh, A.; Rezk, A.; Elhalawany, N.; Ruqeishi, M.; Kocyigit, A. Bahceci, E.; Nayfeh, M.

AIP Advances, 11(12), 125129, December 2021. DOI: 10.1063/5.0077841

Study of Polyethylene Fibers Used in Masks Via Luminescent Aerosolized Silicon Nanoparticles [Article]

Rezk, A.; Ashraf, J.; Alnaqbi, W.; Abdul Hadi, S.; Dushaq, G.; Alhammadi, A.; Elkukhun, T.; Rasras, M.; Nusair A.; Nayfeh M.; Nayfeh A.

Silicon, October 2021. DOI: 10.1007/s12633-021-01463-z

Using Conductive Atomic Force Microscopy to the Evaluate Electrical Properties of MoS₂ nanoparticles for Device Applications [Conference]

Alhammadi, A.; Alnaqbi, W.; Ashraf, J.; Rezk, A.; Nayfeh, A.

ECS Transactions, 104(3), 17, October 2021. DOI: 10.1149/10403.0017ecst

Polarization-based surface enhanced Raman scattering from single colloidal DNA decorated with 3 nm silicon nanoparticles [Article]

Mantey, K.; Quaqiano, L.; Rezk, A.; Palleschi, S.; Abuhassan, L.; Nayfeh, A.; Bahceci, E.; Nayfeh, M.

AIP Advances, 11(10), 105206, October 2021. DOI: 10.1063/5.0061671

Using Otsus Method for Image Segmentation to Determine the Particle Density, Surface Coverage and Cluster Size Distribution of 3 nm Si Nanoparticles [Article]

Ashraf, J.; Abdul Hadi, S.; Rezk, A.; Madjid, N.; Alnaqbi, W.; Alhammadi, A.; Nayfeh, A.

IEEE Transactions on Nanotechnology, 20, 765-774, September 2021. DOI: 10.1109/TNANO.2021.3116185

Absorption in the UV-Vis Region from Chemically Exfoliated MoS₂ Nanoparticles for Solar Applications [Conference]

Alnaqbi, W.; Ashraf, J.; Rezk, A.; Abdul Hadi, S.; Alhammadi, A.; Nayfeh, A.

48th IEEE Photovoltaic Specialists Conference (PVSC 48), June 2021. DOI: 10.1109/PVSC43889.2021.9518587

Strong Reduction in Ge Film Reflectivity by an Overlayer of 3 nm Si Nanoparticles: Implications for Photovoltaics [Article]

Rezk, A.; Abdul Hadi, S.; Ashraf, J.; Alhammadi, A.; Alnaqbi, W.; Kumar, A.; Dushaq, G.; Rasras M.; Saraswat K.; Nayfeh, M.; Nayfeh A.

ACS Applied Nano Materials, 4, 5, 4602, April 2021. DOI: 10.1021/acsanm.1c00107

Time dependence of electrical characteristics during the charge decay from a single gold nanoparticle on silicon [Article]

Abbas, Y.; Rezk, A.; Saadat, I.; Nayfeh, A.; Rezeq, M.

RSC Advances, 10(68), 41741, November 2020. DOI: 10.1039/D0RA08135C

Charging and discharging characteristics of a single gold nanoparticle embedded in Al₂O₃ thin films [Article]

Rezk, A.; Abbas, Y.; Saadat, I.; Nayfeh, A.; Rezeq, M.

Applied Physics Letters, 116, 223501, May 2020. DOI: 10.1063/5.0004000

Improved figures of merit of nano-Schottky diode by embedding and characterizing individual gold nanoparticles on n-Si substrates [Article]

Abbas, Y.; Rezk, A.; Anwer S.; Saadat, I.; Nayfeh, A.; Rezeq, M.

Nanotechnology, vol. 31, no. 12, Jan 2020. DOI: 10.1088/1361-6528/ab5e3e

Effects of 2.85 nm Si Nanoparticles on AZO/n⁺/p-cSi Thin Film Solar Cell [Conference]

Abdul Hadi, S.; Rezk A.; Nayfeh, A.

47th IEEE Photovoltaic Specialists Conference (PVSC 47), Calgary, 14-19 June 2020. DOI: 10.1109/PVSC45281.2020.9300420

Effect of Si Nano-particle Multiple Coats on Reflectance Spectra for Ge and Ge/Si Substrates [Conference]

Abdul Hadi, S.; Rezk, A.; Nayfeh, A.

2020 MRS Spring Meeting & Exhibit, Phoenix, 13-17 April 2020

Charge Effect of an Isolated Gold Nanoparticle Embedded in High-k Oxide [Conference]

Rezk, A.; Abbas, Y.; Saadat, I.; Nayfeh, A.; Rezeq, M.

20th IEEE International Conference on Nanotechnology (IEEE-NANO), Montreal, 28-31 July 2020

Exploring the Electronic Properties of Individual Gold NPs on n- type Si surfaces [Conference]

Abbas, Y.; Rezk, A.; Saadat, I.; Nayfeh, A.; Rezeq, M.

20th IEEE International Conference on Nanotechnology (IEEE-NANO), Montreal, 28-31 July 2020

Modulating Surface Roughness of Low Temperature PECVD Germanium using Multilayer Drop Casting of 2.85nm Silicon Nanoparticles [Conference]

Ashraf J.; [Rezk A.](#); Alnaqbi W.; Alhammadi A.; Abdul Hadi S.; Nayfeh A.

20th IEEE International Conference on Nanotechnology (IEEE-NANO), Montreal, 28-31 July 2020

Photodetection Characteristics of Gold Coated AFM Tips and n-Silicon Substrate nano-Schottky Interfaces [Article]

Abbas, Y.; [Rezk, A.](#); Saadat, I.; Nayfeh, A.; Rezeq, M.

Nature Scientific Reports, vol. 9, no. 13586, Sep 2019. DOI: 10.1038/s41598-019-49908-1

Stability and Endurance of ALD Al-doped ZnO TFTs Grown on Flexible Substrates [Article]

[Rezk, A.](#); Saadat, I.

IEEE Electron Device Letters, IN REVIEW

Effect of Silver Nanoparticles on the Electrical Characterization of Oxide/Semicon. Heterojunctions [Conference]

[Rezk, A.](#); Abbas, Y.; Saadat, I.; Nayfeh, A.; Rezeq, M.

ECS Transactions 2019 (ECST), Dallas, vol. 89, issue 3, pp. 133-136, 26-29 May 2019. DOI: 10.1149/08903.0133ecst

Impact of Silver Nano-particles on Metal- Si Schottky Contact [Conference]

[Rezk, A.](#); Abbas, Y.; Saadat, I.; Nayfeh, A.; Rezeq, M.

19th IEEE International Conference on Nanotechnology (IEEE-NANO), Macau, 22-26 Jul. 2019

The Electrical Transport Characteristics of Ag-NP/n-Si nano Schottky Diodes using Conducting Atomic Force Microscope [Conference]

Abbas, Y.; [Rezk, A.](#); Saadat, I.; Nayfeh, A.; Rezeq, M.

Nanotech France 2019, Paris, 26-28 Jun. 2019

High-Performance ALD Al-doped ZnO Thin Film Transistors Grown on Flexible Substrates [Article]

[Rezk, A.](#); Saadat, I.

IEEE Electron Device Letters, vol. 99, no. 12, pp. 1-1, Jan 2019. DOI: 10.1109/LED.2019.2890831

ALD Al-doped ZnO Thin Film as Semiconductor and Piezoelectric Material: Process Synthesis [Chapter]

The IoT Physical Layer: Design and Implementation

[Rezk, A.](#); Saadat, I.

Springer International Publishing, 2018, Ch. 3, pp. 23-46. ISBN: 3319930990, 9783319930992

ALD Al-doped ZnO Thin Film as Semiconductor and Piezoelectric Material: Characterization [Chapter]

The IoT Physical Layer: Design and Implementation

[Rezk, A.](#); Saadat, I.

Springer International Publishing, 2018, Ch. 4, pp. 47-68. ISBN: 3319930990, 9783319930992

ALD Al-doped ZnO Thin Film as Semiconductor and Piezoelectric Material: Transistors and Sensors [Chapter]

The IoT Physical Layer: Design and Implementation

[Rezk, A.](#); Saadat, I.

Springer International Publishing, 2018, Ch. 5, pp. 69-82. ISBN: 3319930990, 9783319930992

Optimization of Al-doped ZnO films for flexible TFTs and piezoelectric sensors [Conference]

[Rezk, A.](#); Saadat, I.

2017FLEX Europe, Munich, 14-17 Nov. 2017

Optimization of Piezoresponse in ALD Al Doped ZnO Thin Films on Flexible Substrates for IoT Related Sensing Applications [Conference] [Rezk, A.](#); Saadat, I.

12th IEEE Nanotechnology Materials and Devices Conference (NMDC), Singapore, Oct 2017, pp. 27-28. DOI: 10.1109/NMDC.2017.8350489

Memory effect by charging of ultra-small 2-nm laser-synthesized solution processable Si-nanoparticles embedded in Si/Al₂O₃/SiO₂ structure [Article]

Elatab, N., [Rezk, A.](#), Tekcan, B., Alkis, S., Okyay, A. K. and Nayfeh, A.

Physica Status Solidi (a), vol. 212, no. 8, pp. 1751-1755, Feb 2015. DOI: 10.1002/pssa.201431802

An Electro-Dip-Coating Technique for Deposition of Metallic Nanoparticles over Silicon [Conference]

[Rezk, A.](#); Alkhatib, A.; Nayfeh, A.

MRS 2013 Fall Meeting, Boston, MA, 1-6 Dec. 2013

Modeling of InAs/GaAs Quantum Dot Solar Cells [Conference]

[Rezk, A.](#); Islam, K.; Nayfeh, A.

European Modelling Symposium, Manchester, Nov 2013, pp. 677-680. DOI: 10.1109/EMS.2013.113

Zinc-oxide charge trapping memory cell with ultra-thin chromium-oxide trapping layer [Article]

Elatab, N.; [Rezk, A.](#); Okyay, A.K.; Nayfeh, A.

AIP Advances, vol. 3, no. 11, pp. 112-116, Nov 2013. DOI: 10.1063/1.4832237

Thin-Film ZnO Charge-Trapping Memory Cell Grown in a Single ALD Step [Article]

Oruc, F.B.; Cimen, F.; [Rezk, A.](#); Ghaffari, M.; Nayfeh, A.; Okyay, A.K.

IEEE Electron Device Letters, vol. 33, no. 12, pp. 1714-1716, Dec 2012. DOI: 10.1109/LED.2012.2219493

ZnO based charge trapping memory with embedded nanoparticles [Conference]*Rezk, A.; Oruc, F.B.; Okyay, A.K.; Nayfeh, A.*

12th IEEE International Conference on Nanotechnology (IEEE-NANO), Birmingham, Aug 2012, pp. 1-4. DOI: 10.1109/NANO.2012.6322033

Si nanowire memory [Conference] *Rezk, A.; Nayfeh, A.*

12th IEEE International Conference on Nanotechnology (IEEE-NANO), Birmingham, Aug 2012, pp. 1-5. DOI: 10.1109/NANO.2012.6322066

SkillsProficient and *experienced* with a vast array of skills, concepts and technologies:

CVD (PECVD, ALD, <i>MOCVD</i>)	FEOL & <i>BEOL</i>	0D-2D & Bulk Structures	Lithography (Wet, RIE, <i>EBL</i>)
PVD (Sputter, Evaporation, E-beam)	<i>Photonics</i>	Piezoelectric Sensors	Semiconductor Oxides (ZnO)
Microscopy (SEM, AFM, KPFM, <i>TEM, STM</i>)	<i>MEMS</i>	Flexible Electronics	Memories (NVMs, <i>ReRAM</i>)
Spectroscopy (XRD, EDS, Raman, <i>XPS</i>)	<i>COMSOL</i>	Technology-CAD	<i>VHDL & Embedded Systems</i>