GHADA DUSHAQ

+971-50-36 80574

ghb1987@gmail.com

Ghada Dushaq

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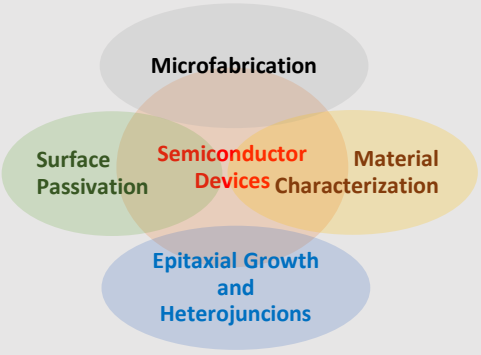
New York University
Saddiyat Island
Abu Dhabi
UAE

Interests

- Solid State Physics
- Material Science
- Semiconductors Devices
- Nanotechnology
- Microfabrication
- Advanced Materials
- Optoelectronics
- Nanophotonics

Skills

Overview



Education

2013 - 2017 **PhD in Interdisciplinary Engineering** (GPA:3.88/4.0)
Masdar Institute of Science and Technology (Khalifa University) in Collaboration with Massachusetts Institute of Technology, Abu Dhabi, UAE.
Thesis Title: Low Temperature Growth of Germanium on Silicon using Plasma Enhanced Chemical Vapor Deposition (RF-PECVD).

2010 - 2012 **M.Sc. Physics** (GPA: 4.0/4)
University of Jordan, Amman, Jordan.
Thesis Title: Structural and Magnetic Properties of $BaFe_{12-2x}$ $(M, T)_xO_1$ Hexaferrites

2005 - 2009 **B.Sc. Physics & Mathematics** (GPA: 3.85/4.0)
BirZeit University, Ramallah, Palestine.

Publications

1. **Ghada Dushaq** and Mahmoud Rasras, Mechanical Nano-Patterning: Toward Highly-Aligned Ge Self-Assembly on Low Lattice Mismatched GaAs Substrate, Scientific Report 9, 14221, 2019.
2. Chiara Cappuccino, Luca Catalano, Francesco Marin, **Ghada Dushaq**, Gijo Raj, Mahmoud Rasras, Rachid Rezgui, Massimo Zambianchi, Manuela Melucci, Pance Naumov, Lucia Maini, Structure-Mechanical Relationships in Polymorphs of Organic Semiconductor (C4-NT3N), Accepted, Crystal Growth & Design, 2019.
3. Khadija Jumaa ,Amna Siddiqui, **Ghada Dushaq**, Mahmoud Rasras, Ammar Nayfeh, Optical and Electrical Properties of RF-PECVD Germanium Spin Coated with 40 nm Silver Nanoparticles, IEEE Nanotechnology Materials and Devices Conference (NMDC), Accepted Abstract, Stockholm, Sweden 27-30 October, 2019.
4. **Ghada Dushaq**, Ammar Nayfeh and Mahmoud Rasras, CMOS compatible GaAs MSM PDs on Si using ultra-thin Ge buffer layer for visible photonic applications, Journal of Applied Physics 126 (20), 2019.
5. **Ghada Dushaq**, Ammar Nayfeh and Mahmoud Rasras, Hexagonal germanium formation at room temperature using controlled penetration depth nano-indentation, Scientific Reports 9, 1593, 2019.
6. **Ghada Dushaq**, Mahmoud Rasras, Integration of Metal- GaAs -Metal Photodetectors on Si using Thin Ge Buffer Layers for Applications in Visible Photonics, Oral Presentation, CLEO®/Europe-EQEC 2019.
7. **Ghada Dushaq**, Plasma Enhanced Processing of Ge Films on Silicon as a Virtual Substrate for Lattice Matched GaAs Growth, Accepted Abstract, MRS Fall Meeting 2018, Hynes Convention Center, Boston, Massachusetts, USA.
8. Khadija Jumaa ,Amna Siddiqui, **Ghada Dushaq**, Mahmoud Rasras, Ammar Nayfeh, Optical and electrical properties of RF-PECVD germanium spin coated with 40nm silver nanoparticle, Accepted Abstract, MRS Fall Meeting 2018, Hynes Convention Center, Boston, Massachusetts, USA
9. **Ghada Dushaq**, Ammar Nayfeh, and Mahmoud Rasras, Nano-Mechanical Probing of Threading Dislocation in Ge-on-Si Films, 2018 IEEE 18th International Conference on Nanotechnology (IEEE-NANO),1-4, 2018.
10. **Ghada Dushaq**, Amna Siddiqui, Ammar Nayfeh and Mahmoud Rasras, Direct growth of thin Ge-on-Si layer at low temperature as a template for lattice matched GaAs based solar cells, 2018 IEEE 7th World Conference on Photovoltaic Energy Conversion, (WCPEC)(A Joint Conference of 45th IEEE PVSC, 28th PVSEC & 34th EU PVSEC), 3857-3860, 2018.
11. Zakriya Mohammed, **Ghada Dushaq**, Aveek Chatterjee, Mahmoud Rasras, An optimization technique for performance improvement of gap-changeable MEMS accelerometers, Mechatronics 54, 203-216, 2018.
12. **Ghada Dushaq**, Ammar Nayfeh, Mahmoud Rasras, Low Temperature Growth of Germanium on Silicon Using RF-PECVD for Electronic and Optoelectronic Application, Meeting Abstracts, 1373-1373, ECS Meeting, Seattle, USA, 13-17 May, 2017.
13. **Ghada Dushaq**, Ammar Nayfeh, and Mahmoud Rasras, Metal-germanium-metal photodetector grown on silicon using low temperature RF-PECVD, Optics express 25 (25), 32110-32119, 2017.

Demographics

- **DOB**: 23/10/87
- **Gender**: Female
- **Nationality**: Jordanian
- **Marital Status**: Single

Languages

- Arabic (Native)
- English (Fluent)

Programs

- Microsoft office
- Matlab
- Origin
- TCAD
- Lumerical
- COMSOL Multiphysics,
- L-Edit
- C/C++

14. **Ghada Dushaq**, Ammar Nayfeh, Mahmoud Rasras, Passivation of Ge/high-κ interface using RF Plasma nitridation, Semiconductor Science and Technology 33 (1), 015003, 2017.
15. Sabina Abdul Hadi, **Ghada Dushaq**, Ammar Nayfeh, Effect of atomic layer deposited Al2O3: ZnO alloys on thin-film silicon photovoltaic devices, Journal of Applied Physics 122 (24), 245103, 2017.
16. **Ghada Dushaq**, Mahmoud Rasras, Ammar Nayfeh, Germanium MOS capacitors grown on Silicon using low temperature RF-PECVD, Journal of Physics d: Applied Physics. 50 (40), 2017.
17. **Ghada Dushaq**, Mahmoud Rasras, and Ammar Nayfeh, Low temperature deposition of germanium on silicon using radio frequency plasma enhanced chemical vapor deposition, Thin Solid Films, 636, 585–592, 2017.
18. **Ghada Dushaq**, Mahmoud Rasras, Ammar Nayfeh, Characteristic of germanium metal-oxide-semiconductor capacitors directly integrated on silicon using low-temperature process, PM01, MRS Fall Meeting, Boston, Massachusetts, November 26 - December 1, 2017.
19. **Ghada Dushaq**, Ammar Nayfeh, Mahmoud Rasras, Germanium metal-semiconductor-metal photodetectors grown on silicon using low temperature RF-PECVD, Frontiers in Optics/Laser Science Conference (FiO/LS), Washington D.C., 2017.
20. **Ghada Dushaq**, Ammar Nayfeh, Mahmoud Rasras, Tuning the optical properties of RF-PECVD grown μc-Si:H thin films using different hydrogen flow rate, Super-lattices and semiconductor 107, 172-177, 2017.
21. **Ghada Dushaq**, Mahmoud Rasras, Ammar Nayfeh, Hydrogen-Induced crystallization of germanium films at low temperature using RF-PECVD reactor, ECS transaction, 77 (5), 213-217, 2017.
22. **Ghada Dushaq**, Mahmoud Rasras, Ammar Nayfeh, A study of the interface quality of Ge-based MOS capacitors using RF plasma nitration , Oral Presentation UAEGSRC'17, Abu Dhabi, UAE, March 20-21, 2017.
23. **Ghada Dushaq**, Mahmoud Rasras, Ammar Nayfeh, "Low temperature Ge surface passivation formed using in-situ NH_3/N_2 PECVD nitration for high quality Ge-MOS capacitors, Frontiers in Theoretical and Applied Physics Conference, UAE 2017 AUS,UAE, Feb 22 - Feb 25, 2017.
24. **Ghada Dushaq**, Mahmoud Rasras, Ammar Nayfeh, "Low temperature germanium surface passivation formed using in situ NH_3/N_2 PECVD nitration for high quality Ge-MOS capacitors," Material research Society, Spring Meeting, Phoenix, Arizona, USA,2017
25. **Ghada Dushaq**, Mahmoud Rasras, Ammar Nayfeh, Distribution and coverage of 40nm gold nano-particles on aluminum and hafnium oxide using electrophoreses method using MOS structures, Material research Bulletin, 86, 302-307, 2017.
26. Zakriya Mohammed, **Ghada Dushaq**, Aveek Chatterjee, Mahmoud Rasras, Bi-axial highly sensitive±5g polysilicon based differential capacitive accelerometer, 2016 17th International Conference on Thermal, Mechanical and Multi-Physics Simulation and Experiments in Microelectronics and Microsystems (EuroSimE), 1-5, 2016.
27. **Ghada Dushaq**, Mahmoud Rasras, Ammar Nayfeh, Impact of $N_2O/NH_3/N_2$ gas mixture on the interface quality of germanium MOS capacitors, ECS Transactions, 75(8), 661-666, 2016.
28. **Ghada Dushaq**, Ammar Nayfeh, Mahmoud Rasras, Tailoring the optical properties of boron doped μc-Si:H thin films by changing the SiH_4/H_2 ratio using RF-PECVD process, FTu3F.2, Frontiers in Optics / Laser Science, Rochester, New York, US, 17-21 Oct, 2016.
29. **Ghada Dushaq**, Nazek Al-Etab, Mahmoud Rasras, Ammar Nayfeh, A study of electrical and optical properties of boron-doped amorphous silicon deposited by RF-PECVD with different B2H6/H2 flow rates, ECS Transaction, 72 (2), 301-304, 2016.
30. **Ghada Dushaq**, Mahmoud Rasras, Ammar Nayfeh, Structural and electrical properties of (MOS) structures prepared by electrophoreses deposition of gold nano-particles on aluminum/ hafnium oxides, Oral Presentation UAEGSRC'16, Al Ain, UAE, April 27-28, 2016.

References

- ***Professor Mahmoud Rasras***
  (PhD Advisor)

Electrical and Computer Engineering, Engineering Division, New York University, Abu Dhabi, UAE
E-mail: mrasras@nyu.edu

- ***Professor Ammar Nayfeh***
  (PhD Co-Advisor)

Department of Electrical Engineering and Computer Science (EECS), A Part of Khalifa University of Science and Technology, Abu Dhabi, UAE

E-mail: anayfeh@masdar.ac.ae

- ***Professor Krishna C. Saraswat***
  (RSC Member)

Electrical Engineering, Stanford University, CA, USA

E-mail: saraswat@stanford.edu

- ***Professor Sami Mahmood***
  (MSc Advisor)

Department of Physics, University of Jordan, Amman, Jordan.

E-mail: s.mahmood@ju.edu.jo

31. **Ghada Dushaq**, T Muluget, Mahmoud Rasras, Micro-opto-mechanical disk for inertia sensing, Photonic Sensors 6 (1), 78-84, 2016.
32. **Ghada Dushaq**, Mahmoud Rasras, Ammar Nayfeh, Electrical and optical characterization of Si1-xGex layers grown by RF-PECVD, Material Research Society, Spring Meeting, Phenix, Arizona ,EP.11.6.06, 2016.
33. Muhaira S. Al Eghfeli, **Ghada H. Dushaq**, Farsad I.Chowdhury, Hiba Riaz, Nawal Aqab, Nazek El-Atab and Ammar Nayfeh, Electrical characterization of ZnO/Al2O3 alloy growth using atomic layer deposition, MRS Fall Meeting, NN10.15, Boston, USA, 2015.
34. **Ghada Dushaq**, Tadesse Mulugeta, Mahmoud Rasras, A Hybrid Opto-Mechanical Micro-Disk Inertia Sensor, Frontiers in Optics, FTu5C. 2, San Jose, USA, 2015.
35. **Ghada Dushaq**, Amro Alkhatib, Mahmoud Rasras, Ammar Nayfeh, Structural characterization of electric-field assisted dip-coating of gold nanoparticles on silicon, AIP Advances 5 (9), 097181, 2015.
36. Sami H Mahmood, **Ghada H Dushaq**, Ibrahim Bsoul, Mufeed Awawdeh, Hassan K Juwhari, Bashar I Lahlouh, Murad A AlDamen, Magnetic properties and hyperfine interactions in M-type BaFe12-2xMoxZnxO19 hexaferrites, Journal of Applied Mathematics and Physics 2 (05), 7712, 2014.
37. Sami Mahmood, **Ghada Dushaq**, Ibrahim Bsoul, Mufeed Awawdeh, Hassan Juwhari, Bashar Lahlouh, Murad Al-Damen, Magnetic properties and hyperfine interactions in M-type BaFe12-xMoxZnxO19 hexaferrites, 2014 Spring World Congress on Engineering and Technology (SCET 2014), Shanghai, China,16-18 April, 2014.
38. **Ghada Dushaq**, Sami Mahmood, Ibrahim Bsoul, Hassan Juwhari, Bashar Lahlouh, Murad Al-Damen, Effects of molybdenum concentration and valence state on the structural and magnetic properties of BaFe11.6MoxZn0.4−xO19 hexaferrites, Acta Metallurgica Sinica (English Letters) 26 (5), 509-516, 14, 2013.
39. Invited paper: **Ghada Dushaq** and Mahmoud Rasras, Micro-opto-mechanical disk for inertia sensing, Thriving to Change the Research Cycle in Photonics Technology, 4th International Conference on Photonics, Berlin, Germany July 28-29, 2016.
40. Invited Paper: **Ghada Dushaq**, and Mahmoud Rasras, Heteroepitaxial Growth of Ge on Si using RF- PECVD, European Thin Films & Coating Materials Technology Congress, 3-6, Stockholm, Sweden, Sep 2018.

Patent

• Mahmoud Rasras, **Ghada Dushaq**, Micro-Opto-Mechanical Disk for Inertia Sensing, patent filed application, 2016.

Research Details

Ongoing Projects

- Light Source Integration Approaches for Silicon Photonics.
- Fabrication of quantum dots using complete physical approach.
- Strain Engineering of 2D materials for visible photonic application.
- Organic single crystals for high-speed circuit operation.

Ph.D. Dissertation: Low Temperature Growth of Germanium on Silicon using Plasma Enhanced Chemical Vapor Deposition (RF-PECVD).

- Growth of Germanium on Silicon using RF-PECVD.
- Structural, optical and electrical characterization of Ge-on-Si.
- Growth of Ge on quartz at low temperature and its characterization.
- Surface passivation techniques (plasma nitration) of bulk Ge.
- Fabrication and characterization of Metal-Oxide-Semiconductor capacitors on bulk Ge using plasma nitration.
- Fabrication and characterization of Ge-on-Si Metal Oxide-Semiconductor capacitors.
- Fabrication and characterization of Ge-on-Si Metal-Semiconductor-Metal photodetector.

M.Sc. Dissertation: Structural and Magnetic Properties of $BaFe_{12-2x}(M,T)_xO_{19}$ Hexaferrites

- Modification of the properties of substituted BaM hexaferrites prepared by chemical and physical methods.

Other Research Projects:

- Designing Micro-opto-mechanical structures for inertia sensing.
- Tailoring the optical properties of boron doped μc-Si:H thin films by changing the SiH_4/H_2 ratio using RF-PECVD process.
- Structural characterization of electric-field assisted dip-coating of gold nanoparticles on silicon, aluminum oxide, and hafnium oxide.
- Electrical and optical characterization of ZnO/Al_2O_3 alloy growth using atomic layer deposition.

Work Experience (Academia)

2017-Present	Post-Doctoral associate at New York University, Abu Dhabi, UAE.
2016-2017	Teaching assistant at Masdar Institute of Science and technology, Abu Dhabi, UAE.
2013-2014	Lecturer at physics department at Birzeit University, Ramallah, Palestine.

Teaching Experience

Undergraduate courses:

- Fundamental of physics 1: Newton's laws of motion and their applications; mechanical conservation laws; motion of rigid bodies; fluid mechanics, oscillations and the law of universal gravitation.
- Fundamental of physics lab 1: Survey of basic laboratory techniques and methods; taking measurements, data evaluation and report writing with application to selected experiments in mechanics, heat, optics and electricity.
- Fundamental of physics 2: Electrostatics; Magnetic field and induction; direct and alternating current circuits; dielectrics; magnetic materials; Introduction to Maxwell's equations and electromagnetic waves and geometrical optics.
- Fundamental of physics 2 lab: Experiments in electricity and magnetism including electrostatics, magneto-statics, DC and AC circuits and applied electric circuits.

Graduate courses (Teaching Assistant):

- Integrated microelectronics: semiconductor fundamentals, p-n junction, metal-oxide semiconductor structure, metal-semiconductor junction, MOS field-effect transistor, bipolar junction transistor and basics of optoelectronic devices. Emphasis on physical understanding of device operation through energy band diagrams. Issues in modern device scaling outlined.
- Physics of solar cells: Physics of semiconductors in photovoltaic devices (PN, PIN junction, electron hole generation, thin film solar cell), physical models of solar cell operation, characteristic and design of common types of solar cell, material intrinsic properties (optical, electrical) and tuning them, approaches to increasing solar cell efficiency, solar cell complete fabrication and performance characterization.

Technical Skills

- **Micro fabrication and material characterization techniques**: Ultra High Vacuum Systems (UHVS), Scanning Electron Microscopy (SEM), X-ray Diffraction (XRD), Mössbauer Spectroscopy, Magnetometry (VSM), Elemental Analyses (EDS). Atomic Layer Deposition (ALD), Plasma Enhanced Chemical Vapor Deposition (PECVD), Lithography & Photolithography, Nanoindentation, nanoscribe, Physical Vapor Deposition (PVD), Dry etching using RIE and DRIE process, wet processing for sample cleaning and etching, Atomic Force Microscopy (AFM), UV-VIS-INR Spectrophotometer, Variable Angle Ellipsometery, Hall Measurements, Focused Ion Beam (FIB), Transmission Electron Microscopy (TEM), TEM sample preparation using FIB, XPS, Raman Spectroscopy, Near Field Scanning Optical Microscopy (SNOM), Photoluminescent (PL), Fourier transform Infrared spectroscopy (FT-IR), IV& CV electrical tracing.
- **Materials**: Semiconductor Thin Films (Germanium, Amorphous and Crystalline Silicon, Zinc Oxide, Hafnium oxide, Aluminum oxide, Silicon nitride, Silicon oxynitride, Silicon Germanium, Germanium oxynitride, Germanium oxide), Nanoscale Fine Particle Systems (Gold Nano Particles), Magnetic Materials (Barium Hexaferrites), Organic Crystals, Perovskite, 2D Materials.
- **Devices**: Transistors (Thin Film Transistor (TFT), Metal Oxide Field Effect Transistor (MOFET)), Memory Devices, Micro-Opto- Electro- Mechanical Systems (Inertia Sensor), Photodetectors (MSM, PIN, PN), Metal Oxide Semiconductor Capacitors (MOSCAP), Solar cells.

Honor &Awards

- Honor Role for Eight Semesters, 2005-2009, BirZeit University, Ramallah, Palestine.
- Musa Naser Financial Awards for Distinguished Physics Students, 2005-2009, BirZeit University, Ramallah, Palestine.
- Innovation and Distinction Honor List, 2012, University of Jordan, Amman, Jordan.
- Post-Doctoral Conference and Travel Award, New York University Abu Dhabi, 2018
- International Association of Advanced Material (IAAM) Scientist Medal for the year of 2018, Stockholm, Sweden.

Fellowships& Scholarships

- German Academic Exchange Services (DAAD) Competitive Scholarship toward M.Sc. Degree in Physics. 2010 –2012, Amman, Jordan.
- Masdar Institute of Science and Technology Scholarship toward a Ph.D. Degree in Interdisciplinary Engineering Specialized in Microsystem Engineering, January 2014–2017, Abu Dhabi, UAE.
- New York University Abu Dhabi for postdoctoral reserch at engineering devision, 2017-2019
- Islamic Development Bank fellowship Competitive Scholarship toward PhD. Degree in Physics. 2013, declined
- German Academic Exchange Services (DAAD) Competitive Scholarship toward PhD. Degree in Physics (Stuttgart University, Germany), 2013, declined

Membership in Scientific Societies

- American Optical Society (OSA), since 2014
- Material Research Society (MRS), since 2015.
- Electrochemical Society (ECS), since 2015.
- American Physics Society (APS), since 2015

Synergetic Activities

- TPC member of the European Thin films and coating materials Technology Congress, Stockholm, Sweden, 2018.
- Regular reviewer for a number of international journals and Conferences including: Optics Express, Photovoltaic Specialist Conferences (IEEE PVSC), Journal of Material Science, Scientific Report, Optics Express Material, Journal of applied physics.
- Co-investigator of NYUAD Research Enhancement and UAE department of education and knowledge, ADEK Awards for Research Excellence (AARE 2018) projects.

Workshops, Summits and Training

- Abu Dhabi Sustainability Week (ADSW) is the annual global gathering that brings businesses and nations together to address challenges and celebrate achievements in sustainable development and clean energy, 2017.
- Coventor software, MEMS+, and 3D Simulator training course in Institute of Microelectronics (IME), a star, Singapore, Oct 29 – 31, 2015.