

# Douglas Murad

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## Profile

PhD researcher at the University of Glasgow working across nanophotonics, plasmonic nanostructures, thin-film optical characterisation, spectroscopy, and electromagnetic modelling. Experienced with spectroscopic ellipsometry using J.A. Woollam CompleteEASE for PMMA thin-film thickness fitting on gold-coated plasmonic nanostructures. Previous semiconductor and nanofabrication experience includes GaAs micro-LED fabrication/testing, nickel-chromium thin-film resistor arrays, profilometry, scanning electron microscopy, and optical/electrical device characterisation. Interested in opportunities in thin-film metrology, photonics process development, semiconductor device characterisation, and optical manufacturing.

## Key Skills

**Thin-film metrology:** Spectroscopic ellipsometry, J.A. Woollam CompleteEASE, optical model fitting, PMMA thickness extraction, Dektak profilometry

**Nanofabrication:** Photolithography, electron-beam lithography, mask design, GDS preparation, metal deposition, lift-off, rapid thermal annealing, wet etching

**Optical/device characterisation:** Optical spectroscopy, photoluminescence, fluorescence lifetime imaging microscopy, optical rotation dispersion, polarisation-resolved measurements, light-current-voltage measurements, current-voltage measurements, spectral response, optical power measurements, CTLM analysis

**Modelling and analysis:** COMSOL Multiphysics, Python, MATLAB, Origin, Excel

**Microscopy:** Optical microscopy, scanning electron microscopy image analysis

## Education

**Doctor of Philosophy, University of Glasgow** | Expected Completion: Jul 2027

Nanophotonics and Plasmonic Nanostructures. Research focused on plasmonic chiral nanostructures, optical spectroscopy, and emitter-plasmon interactions, including quantum-dot and dye-based photoluminescence systems.

**Master of Science in Nanoscience and Nanotechnology, University of Glasgow** | Sep 2022 to Dec 2023

IET-accredited programme covering semiconductor fabrication, nanomaterials, cleanroom processing, device characterisation, and nanoscale physics.

**Bachelor of Science in Physics, COMSATS University Islamabad** | Feb 2017 to Aug 2021

Foundation in theoretical and experimental physics, mathematical methods, optics, electronics, electromagnetism, and scientific problem solving.

## Relevant Research and Project Experience

**Doctoral Researcher, University of Glasgow** | Oct 2023 to Present

- Research nanofabricated chiral plasmonic nanostructures for light-matter interaction studies, combining optical spectroscopy, fluorescence measurements, nanostructure characterisation, and electromagnetic simulation.
- Used J.A. Woollam CompleteEASE for spectroscopic ellipsometry modelling and PMMA thin-film thickness fitting on gold-coated shuriken plasmonic nanostructures.
- Characterise left-handed and right-handed plasmonic arrays using optical rotation dispersion, photoluminescence, fluorescence lifetime imaging microscopy, and polarisation-resolved optical measurements.
- Analyse wavelength-dependent spectra, resonance shifts, lifetime data, and surface-functionalisation effects using Python, MATLAB, Origin, and Excel.
- Use COMSOL Multiphysics for electromagnetic simulations of nanostructured plasmonic arrays.

**Gallium Arsenide Micro-LED Fabrication and Testing, University of Glasgow** | Feb 2023 to May 2023

- Fabricated and characterised GaAs-based micro-LED devices using cleanroom semiconductor processing and optoelectronic testing methods.

- Worked with S1818 photolithography, Ti/Au p-contact metallisation, Ni/Au/Ge/Ni/Au backside n-contact metallisation, lift-off, rapid thermal annealing, mesa lithography, wet etching, Dektak profilometry, and final resist removal.
- Performed light-current-voltage measurements, spectral characterisation, optical power measurements, and circular transmission line model analysis.
- Measured near-infrared emission around 730 to 735 nm and analysed current-dependent red-shift behaviour and thermal rollover effects.

**Nickel-Chromium Thin-Film Resistor Array on Silicon/Silicon Dioxide, University of Glasgow | Sep 2022 to Dec 2022**

- Designed, fabricated, and characterised nickel-chromium thin-film resistor arrays using L-Edit mask design, GDS preparation, electron-beam lithography, oxygen plasma ashing, metallisation, and lift-off.
- Patterned aluminium contact pads using photolithography, mask alignment, metal deposition, and lift-off.
- Used scanning electron microscopy, Dektak profilometry, and probe-station current-voltage measurements to assess pattern transfer, film thickness, contact-pad height, and device resistance.

**Electrohydrodynamic Modelling of Polymer-Assisted Nanofiber Formation, COMSATS University Islamabad | Feb 2020 to Aug 2021**

- Worked on titanium dioxide precursor/polymer composite nanofibers fabricated using electrospinning.
- Used scanning electron microscopy images to assess fibre morphology, diameter variation, and material structure.

**Additional Experience**

**Graduate Teaching Assistant, University of Glasgow | Sep 2025 to Present**

Support undergraduate laboratory teaching, tutorials, marking, feedback, experimental methods, data analysis, and safe laboratory practice.

**Undergraduate Project Supervisor, University of Glasgow | Sep 2024 to Mar 2025**

Supervised an undergraduate research project, supporting experimental planning, data analysis, interpretation, and scientific communication.

**Publication**

V. Tabouillot, M. Murad, D. Wilkinson, R. Kumar, P. L. Lalaguna, M. Hajji, A. S. Karimullah, N. Gadegaard, A. Malfait, P. Woisel, G. Cooke and M. Kadodwala, "Optical write-erase chemical memory state in plasmonic nanoarrays," *Chemical Science*, 2026, 17, 2694. DOI: 10.1039/D5SC07368E

**Awards**

EPSRC Full PhD Scholarship Funding, University of Glasgow, 2023

Full Undergraduate Scholarship Funding, Higher Education Commission, 2017