

# ALDEN PANICKER

University of Waterloo



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## NANOTECHNOLOGY ENGINEERING - FOURTH YEAR COOP

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### SUMMARY

Nanotechnology Engineering Student and photonics & nanofabrication researcher with **end-to-end wafer process experience in cleanroom**, in depth knowledge of **semiconductors and MOSFETS**, extensive wet/dry lab background, digital modeling (**CAD, COMSOL, optics & heat transfer**) proficiency, and a track record of turning innovative ideas into **IP and publications**.

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### PROFESSIONAL EXPERIENCE

#### Harvard School of Engineering & Applied Sciences (SEAS)

May 2025 - Present

Permanent Part-Time Researcher

Transforming novel photonic-fluidic technologies into **patented IP** and **peer-reviewed publications**.

- **Inventor** - patent application in preparation; claims drafted and prior-art reviewed with counsel on **optical display** photonic technology
- **Lead author** on paper on next-generation **optical display/encryption technology** with dynamic view-angle control (In progress)
- **Key Co-Author** on ~4 additional papers spanning nanomaterial and photonic-fluidic devices - In progress, first submission scheduled in coming month(s)

#### Harvard SEAS – Aizenberg Lab – Visiting Researcher (Co-op)

Sep 2024 - May 2025

- Designed wafers in **KLayout** and executed **cleanroom nanofab flows** end-to-end: MLA Lithography, RIE (etching), PVD/CVD (deposition) thin film; measured with metrology (profilometry, ellipsometry)
- Fabricated **high-aspect-ratio** diffraction gratings and micro-structured optics, inspected via profilometry and ellipsometry.
- Used nanoparticles and thin films to tune visible–IR transparency; **UV-Vis/FTIR** characterization of absorbance/transparency spectrums - saw **+30% reduction** in **energy** usage on window devices.
- Performed PDMS **soft lithography**—O<sub>2</sub>-plasma cleaning, silanization, mixing/degassing, and curing to fabricate microstructures.
- Developed physics-based **optical and multimode heat-transfer models** to characterize devices in **MATLAB**.
- Ran opto-thermal **experiments** quantifying heat flux and optical control (radiative cooling, specularly tuning, heat storage), demonstrating **dynamic radiative control** for building-scale thermal and optical management.

#### Quantum Nano Center - University of Waterloo

##### **Semiconductor and Electrical Engineering:**

- Full fabrication and testing of **MOSFETs** and **Integrated Circuit** structures on silicon wafers; performed four point probe measurements and I-V + C-V sweeps; extracted threshold voltage, mobility, and wrote technical report.
- **Synthesized** and evaluated Quantum Dots and built **QDLED** devices; ran optical/electrical tests to verify emission peak, luminescence, and stability and acquired bandgap and particle size.

##### **Materials + Nanomaterials Engineering:**

- Used **Scanning Electron Microscope (SEM)** to visualize topography and composition of Nanogold wires (~1 nm thick)
- Analyzed **Carbon Nanotubes** with Raman and UV-vis spectroscopy.
- Performed **emulsion polymerization** of polystyrene: selected surfactant/initiator concentrations and controlled particle size, measuring with **DLS** and **AFM**.
- Characterized polymers mechanically and thermally (**tensile, impact, DSC, TGA**) across HDPE, HDPE + 5 wt% wax, HDPE + 10 wt% graphene black, and LDPE, and **authored a technical report** connecting filler/branching to macroscale properties.