

# ALONSO PORTILLO

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## EDUCATION

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### University of Waterloo

Bachelor of Applied Science in Chemical Engineering

2024 – 2029

- 3.8 GPA / 88% average; Dean's Honour Roll; 1st place, First-Year Chemical Engineering Design Competition

## SKILLS

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**Battery and Cell Engineering:** Lithium-ion packs, 13S5P and 14S4P module architecture, busbars, thermal interfaces, BMS fundamentals, regenerative braking

**Electrochemistry and Materials:** Graphene exfoliation, aerogels, CNTs, PANI, binders, contact angle, electrode-electrolyte interfaces, CV screening

**Testing and Characterization:** TGA, FTIR, compression testing, adhesion testing, high-temperature wettability, thermal curing, failure mode documentation

**Tools and Data:** SolidWorks, AutoCAD, MATLAB, Python, App Designer, Monte Carlo simulation, statistical analysis, technical reporting

## EXPERIENCE

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### Simulation and Data Analysis Intern

Jan 2026 – Apr 2026

RAYTHEON - P&WC

Mississauga, ON

- Built a MATLAB App Designer Monte Carlo dashboard wrapping a proprietary aeroacoustic model, running 50,000 evaluations per sweep to quantify EPNL uncertainty against certification margins
- Parallelized stochastic simulations with **parfor**, reducing full validation sweeps from 4.5–5 hours to 25–30 minutes while improving statistical confidence in engineering decisions
- Implemented independent sampling, convergence checks, and percentile envelopes across 8 uncertainty inputs, translating complex model behavior into defensible validation outputs

### Research Assistant

May 2025 – Aug 2025

NATURAL RESOURCES CANADA - CANMETENERGY

Ottawa, ON

- Evaluated bio-oil and FeO-hybrid binders through adhesion, wettability, thermal curing, and pelletization tests to support low-carbon steelmaking material selection
- Built Python video-processing workflows for 120+ droplet frames and used contact-angle data to rank binder wetting behavior across organic and inorganic formulations
- Fabricated 0.7 g biocarbon pellets and compared curing, FeO loading, and failure modes to connect binder chemistry with strength and handling durability

### Research Assistant

Dec 2024 – May 2025

KAMKAR LAB, UNIVERSITY OF WATERLOO

Waterloo, ON

- Produced graphene-rich carbon material from graphite using electrochemical exfoliation, vacuum filtration, washing, and sonication for conductive composite applications
- Formulated and 3D printed cellulose aerogels with graphene, CNTs, and PANI additives for CO<sub>2</sub> capture and early supercapacitor electrode screening
- Created a graphene synthesis SOP and training video used by 5 students and 2 co-op hires, reducing onboarding time from 3 days to 1.5 days

## PROJECTS

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### EV Battery Module and Cooling Integration

- Contributed SolidWorks CAD to a 14S4P battery module for an 11-module competition EV pack, resolving cell, busbar, cooling-plate, and housing interference issues
- Refined aluminum busbar geometry for manufacturability while preserving current-carrying cross-section and packaging clearance for thermal and electrical subsystems
- Presented weekly CAD updates during VSI design reviews, coordinating clearance changes with electrical and thermal subteams before shared-file release
- Used interference checks to protect module-level packaging decisions before they propagated into the full 11-module pack layout

### Electric Go-Kart Battery and Regenerative Braking Rebuild

- Built a 48V, 13S5P lithium-ion pack using Samsung 30Q 18650 cells for a 2000W BLDC drivetrain, integrating fuse protection, XT60 output, and passive thermal management
- Breadboarded Arduino-based regenerative braking logic to switch the BLDC motor between drive and generator modes before full wiring-harness integration
- Packaged the battery, controller, and motor around a sprocket clearance slot while separating high-current power wiring from throttle and brake signal lines
- Selected 13S5P architecture to match the 48V controller range while balancing current delivery, capacity, and manageable pack assembly

### Direct Carbon Fuel Cell Interface Testing

- Prepared molten carbonate electrolyte trials at 900°C and measured carbon-electrolyte wetting behavior under ambient and CO<sub>2</sub>-rich atmospheres
- Identified a strong-wetting electrolyte candidate that dropped from approximately 140° to 45° over 120 minutes, supporting DCFC material selection
- Processed 2–3 hour furnace videos into timed contact-angle datasets to quantify electrode-electrolyte interface stability under realistic operating conditions