

Ali Atyabi, Ph.D.



Thermal-Mechanical R&D Engineer | CFD & Multi-Physics Simulation

✉ atyabi902@gmail.com | 📞 +32 484 645 223 | 📍 Leuven, Belgium

🌐 [linkedin.com/in/s-ali-atyabi](https://www.linkedin.com/in/s-ali-atyabi) | 🌐 [atyabia.github.io](https://github.com/atyabia)

Profile Summary

Mechanical engineer with 10+ years of specialized expertise in high-fidelity CFD, finite element modeling, and multi-physics simulation of fluidic, thermal, and mechanical systems. Proven track record developing advanced computational models for embedded active/passive cooling channels and hot-spot mitigation flow fields in PEM fuel cell systems, as well as conducting comparative analyses of active cooling flow field designs for EV Li-ion battery packs. Strong industrial background collaborating with cross-functional teams (**imec**, **VITO**, **J&J**, **John Cockerill**) to translate complex multi-scale simulation datasets into optimized, high-value advanced thermal management solutions.

Technical Expertise

CAE & Simulation: COMSOL Multiphysics (Expert), ANSYS Fluent (Expert), Multi-Physics Coupling (Coupled Electro-Thermal-Mechanical simulations, Fluid flow, Mass/Species transport).

Scripting & Automation: Python API automation for parametric optimization, advanced post-processing, and custom numerical code development; MATLAB / Simulink.

Design : SolidWorks, AutoCAD; design of mechanical and fluidic components for cooling assemblies and complex flow fields.

Optimization & ML: Python, Machine Learning surrogate modeling (RFR, GBR) based on CFD-generated databases; Multi-Objective Optimization (NSGA-II).

Education

Ph.D. in Mechanical Engineering 2014–2019
Energy Conversion, University of Isfahan
Dissertation: Numerical and Thermodynamic Modeling and Multi-Objective Optimization of a PEM Fuel Cell Car Power Generation System Using Genetic Algorithms.

M.Sc. Mechanical Engineering 2010–2013
Energy Conversion, Isfahan University of Technology
Focus: Computational Fluid Dynamics Modeling and Design Optimization of a Honeycomb Flow Field for a PEM Fuel Cell Stack.

B.Sc. Mechanical Engineering 2005–2009
Solid Mechanics Design, Isfahan University of Technology

Key Achievements & Impact

- Established a highly productive collaboration with **imec** through joint research at KU Leuven; familiar with imec's interdisciplinary, open research ecosystem.
- Author of **13+ peer-reviewed journal papers** and **1 granted patent** (in-situ coke-combustion system, deployed at a live plant) – full list at [atyabia.github.io](https://github.com/atyabia) publications.
- Trained and mentored 3+ Ph.D. students in multi-scale transport theory, advanced grid generation, and model validation methodologies.

Languages

English: Fluent (Professional Proficiency)

Persian: Native | **Dutch:** B1.1 (Improving)

Professional Experience

KU Leuven University Jan 2024–Present
Associate Researcher → Junior Academic Staff (BAP) → Administrative & Technical Staff (ATP), Leuven, Belgium

- Developed multi-physics CFD models for **electrodialysis** membrane systems using COMSOL, coupling species transport, multi-component fluid flow distribution, concentration polarization, and electrochemical kinetics.
- Engineered comprehensive predictive multi-domain models for medical **osmotic pump** applications in a successful joint research initiative with **Johnson & Johnson** teams.
- Automated complex parametric sweeps and high-throughput virtual prototyping runs using custom **Python API integrations** to extract structural-fluidic design trends.

VITO Sep 2021–Jan 2024
Research And Development Engineer, Mol, Belgium

- Designed and optimized complex multi-scale flow fields using multiphase CFD (COMSOL), achieving a validated **30% net energy reduction** by eliminating fluid stagnation and mitigating dead zones.
- Formulated high-fidelity structural fluid models for porous transport layers (PTL) and multi-component assemblies, calibrated against empirical data.
- Scripted **Python-based digital twins** and automated tools for transient process modeling, mass balance tracking, and scaling analysis.
- Managed collaborative R&D milestones with **John Cockerill** on manufacturing constraints and fluidic architecture design rules for scale-up.

INSF Oct 2020–May 2021
Researcher (Contract), Tehran

- Built advanced multiphysics finite element and CFD models for fuel cell membrane electrode assemblies (MEAs), coupling simultaneous heat/mass transport with local reaction kinetics.
- Partnered with **Braunschweig University (Germany)** on joint aerospace-focused numerical modeling of transport phenomena in weight-constrained stacks.

Li-Ion Battery Thermal Management 2020
Lead Simulation Engineer, University of Isfahan

- Method:** Conducted high-fidelity advanced CFD simulations coupled with electrochemical-thermal transient multi-field modeling approaches using **ANSYS Fluent**.
- Achievement:** Engineered an advanced embedded cooling solution that limited overall thermal gradients to within 5K while preserving an optimal 25–40°C threshold at 4C discharge states to mitigate severe hotspot degradation.

University of Isfahan 2014–2019
PhD Researcher, Isfahan

- Conducted fundamental multi-scale modeling of transport fields across multi-component material boundaries and specialized separation systems.
- Coupled mechanical stress/contact-pressure deformation with multiphysics transport models to quantify thermal and electrical contact resistance in stacked assemblies (published methodology).

Persian Gulf University Sep 2019–Sep 2020
Researcher, Bushehr Province, Iran

- Developed coupled, high-temperature transient fluid-thermal CFD models to simulate multiphase transport inside cracking furnace hardware.
- Optimized industrial mixing nozzle spargers and fluidic delivery components for hydraulic/thermal efficiency.