

Maria Alejandra Garzón Vargas

@ maria.garzon@tamu.edu
+1 979 739 2410
College Station, Texas, United States



PROFILE

Physics Engineer and MSc in Applied Physics, with emphasis on developing and analyzing energy product solutions. With interest in materials science, renewable energy, research, and CAD/CAM/CAE. With experience in R&D projects involving storage systems for energy transition through design and testing, data analysis, and experimentation. Experience in molecular dynamics simulations, thermal analysis through finite element method, material characterization techniques, and intellectual property protection. With the ability to work in interdisciplinary groups, assuming individual and team responsibilities. With good analytical and problem-solving skills.

PROFESSIONAL EXPERIENCE

Visitor Research Intern

Molecular dynamics simulations for characterize materials properties

October 2022 - December 2023 Texas A&M University

- Scaling analysis of multiple computation clusters at the Texas Advanced Computing Center for selecting a proper number of cores for molecular dynamics simulations.
- Use the software LAMMPS to investigate the steric repulsion effect of a monolayer graphene sheet using different sizes at various temperatures.
- Use of the molecular builder software Moltemplate to study temperature-induced phase transition in 2D perovskites.

Graduated Research Assistant

Design, testing, and patent application for a Solar Brick.

July 2021 - December 2022 Universidad EAFIT

- Design of a locking mechanism to attach a solar cover to a masonry unit for photovoltaic facades with electro-mechanical devices storage.
- In-situ measurements of electrical variables to estimate energy generation potential of a wall made of solar bricks integrated into a residential facade.
- Participation in the prior art analysis and patentability analysis for the patent application of a photovoltaic masonry unit with a lithium-ion energy storage unit.

Research assistant

Energy sustainable construction. Energética 2030 Program

March 2020 - December 2020 Universidad EAFIT

- Redesigning of a photovoltaic building supply for facades, including technical aspects of conceptual and detailed design. Use of CAD modeling and experimental testing.
- Design of a reconfigurable 18650 lithium-ion battery module for use inside solar facades, considering mechanical, electrical, and safety components. Use of CAD modeling and material analysis.

EDUCATION

MSc in Applied Physics (research modality)

Universidad EAFIT

July 2021 - July 2023

Engineering Physics

Universidad EAFIT

January 2016 - June 2021

Diplomate in Photovoltaic Solar Energy: Technical and Financial Aspects

Universidad EAFIT

August 2019 - December 2019

ABILITIES

Creative

Responsible

Interdisciplinary and team work

Autonomous

Quick learning

SOFTWARE

Solidworks

Creo Parametric

Látex

Solidworks Simulation

Python

LAMMPS

Ovito

Moltemplate

Microsoft Office package

LANGUAGES

Spanish

Native Speaker



English

CEFR Level: C1

IELTS overall score: 7 (January 2023)



Research assistant

Reutilization of electric vehicle batteries for second-life applications.
Energética 2030 Program

📅 February 2019 - June 2019

📍 Universidad EAFIT

- Redesign and adaptation of a 18650 lithium-ion battery from a solar vehicle for stationary energy storage applications in a photovoltaic charging station. Use of CAD modeling, prototyping, and electrical testing.

Professional internship

Energy sustainable mobility and construction. **Energética 2030 Program**

📅 July 2019 - December 2019

📍 Universidad EAFIT

- Support in designing an electrical cabinet for a photovoltaic charging station adapted with a second-life battery. Use of CAD modeling, Solidworks, and Solidworks Electrical.
- Research and documentation process related to the adaptation of second-life batteries in construction supplies.
- Design and set up of experimental tests for the characterization of a 18650 lithium-ion vehicular battery subjected to different consumption demands, considering their charge and discharge profiles and monitoring systems.

PROJECTS

Thermal evaluation of a solar brick integrated with a battery pack in tropical regions

MSc in Applied Physics graduate thesis

📅 July 2021 - November 2022

📍 Universidad EAFIT

- Design of experimental set up for testing the thermal behavior of a photovoltaic masonry unit under tropical environmental conditions. Measurement and processing of solar radiation and temperature data using Python.
- Experimentally validated computational model to estimate the thermal behavior of a battery integrated into a non-structural solar masonry unit for facades subject to tropical conditions. Use of CAD modeling, thermal simulation in Solidworks and Python data processing.

Thermal analysis of 18650 lithium-ion batteries for applications in closed unventilated cavities of residential walls

Engineering physics graduate thesis

📅 July 2020 - May 2021

📍 Universidad EAFIT

- Evaluation of the feasibility of using a lithium-ion battery system in closed cavities and without cooling subjected to different operating conditions and technical standards.
- Design of an experimental setup for temperature measurement during different discharge cycles of a lithium-ion cell to validate a finite element model. Use of Solidworks Simulation and Python data processing.

Application and characterization of a TiN coating

Plasma materials processing. MSc course project

📅 June 2021 - December 2021

📍 Universidad EAFIT

ACHIEVEMENTS



Honorable Mention Award for Master's thesis

Universidad EAFIT - School of Applied Science and Engineering. 2023



MSc in Applied Physics Scholarship

Universidad EAFIT - Energética 2030 Research Program. 2021



Scholarship for undergraduate studies in Engineering Physics

ICETEX Best High School Graduates. 2015

HOBBIES



Draw



Hiking



Play guitar

REFERENCES

Ph.D. Uriel Zapata

@ Professor Universidad EAFIT

✉ uzapata@eafit.edu.co

☎ +57 311 324 1453

Ph.D. José Ignacio Marulanda Bernal

@ Professor Universidad EAFIT

✉ jmarulan@eafit.edu.co

☎ +57 321 614 9575

Ph.D. Esteban Betancur Valencia

@ Professor Universidad EAFIT

✉ ebetanc2@eafit.edu.co

☎ +57 313 672 6555

- Application of a TiN coating by magnetron sputtering PAPVD technique. Characterization of the coating layers by AFM and SEM techniques.

Fabrication and characterization of a Perovskite solar cell

Final Project for the Diplomate in Photovoltaic Solar Energy

📅 August 2019 - December 2019 📍 CIDEMAT UdeA - Universidad EAFIT

- Fabrication of a functional Perovskite solar cell by dye application and laser layer removal techniques. Characterization by profilometry, microscopic observation, and absorbance spectrum testing.

PATENTS

- Masonry unit for photovoltaic facades with an integrated energy storage system (Solar brick). Energética 2030 Research Program. Project 02: Sustainable Construction. Universidad EAFIT. Patent submitted (2023).

PUBLICATIONS

- Namakian, R., Garzón-Vargas, M. A., Qing, T., Wei, G. (2023). On the temperature induced phase transition in 2D perovskites: A molecular dynamics simulation study. Under preparation.
- Garzón-Vargas, M. A., Ahmadpoor, F., Wei, G. (2023). Steric Interaction of Graphene by Molecular Dynamics Simulation. Under submission.
- Garzón-Vargas, M. A., Betancur-Valencia E., Ruiz-Salguero, O., Marulanda-Bernal, J.I., Zapata U. (2023). Thermal evaluation of a photovoltaic masonry unit integrated with lithium batteries under environmental conditions of tropical regions. Under submission (Journal).
- Garzón-Vargas, M. A., Fernández-Montoya, M., Marulanda-Bernal, J.I., Betancur-Valencia E. (2023). Computational simulation of transient thermal behavior in lithium-ion batteries from a simplified analytical model assuming a constant Equivalent Series Resistance. Under submission (Journal).
- Garzón-Vargas, M. A., Velásquez-López, A., & Betancur, E. (2020, September). Criteria to locate lithium batteries within buildings. A case study. In 2020 9th International Conference on Renewable Energy Research and Application (ICRERA) (pp. 371-376). IEEE.
- Sanín, R., Fernández-Montoya, M., Garzón-Vargas, M. A., & Velásquez-López, A. (2019, October). Battery State of Charge Estimation Error Comparison Across Different OCV-SOC Curve Approximating Methods. In Workshop on Engineering Applications (pp. 605-615). Springer, Cham.