Mariana Arpini Vieira, Ph.D.

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PROFESSIONAL SUMMARY

Materials Chemist and R&D Scientist with a Ph.D. in Chemistry (Materials Science) and 10+ years of hands-on experience in catalyst development, clean energy research, nanomaterials synthesis and characterization, electrochemical processes, and laboratory operations. Proven track record in experimental design, process scale-up, SOP development, safety compliance, and technical documentation. Experienced in mentoring graduate researchers, contributing to peer-reviewed publications, and communicating complex scientific findings to diverse audiences. Currently a Mitacs Accelerate Fellow. Volunteer scientific manuscript reviewer for Elsevier and MDPI. Certified in WHMIS 2015 and Transportation of Dangerous Goods (TDG). Committed to rigorous, reproducible, and safety-compliant research in collaborative, multidisciplinary environments.

TECHNICAL SKILLS

Materials Characterization

X-Ray Diffraction (XRD), Fourier-Transform Infrared Spectroscopy (FTIR), Raman Spectroscopy, Scanning Electron Microscopy (SEM), Energy-Dispersive X-Ray Spectroscopy (EDX), Transmission Electron Microscopy (TEM), Thermogravimetric Analysis (TGA), Differential Scanning Calorimetry (DSC), Solid-State Nuclear Magnetic Resonance (NMR), BET Surface Area Analysis, UV-Vis Spectroscopy, Photoluminescence Spectroscopy, Atomic Force Microscopy (AFM)

Analytical Techniques

Gas Chromatography-Mass Spectrometry (GC-MS), Liquid Chromatography-Mass Spectrometry (LC-MS), Absorption Spectrometry, Mass Spectrometry, Elemental Analysis, Calibration Curve Preparation, Analytical Standards Preparation

Materials Synthesis and Processing

Electrochemical Exfoliation and Deposition, Graphene Oxide Synthesis and Reduction, Graphene Quantum Dot Synthesis, Carbon Nanomaterial Synthesis, Catalyst Synthesis and Optimization, Wet Chemical Synthesis, Sol-Gel Methods, Polymerization, Electrochemical Graphite Exfoliation

Sample Preparation and Fabrication

Thin Film Deposition (Sputtering, Evaporation), Atomic Layer Deposition (ALD), Spin Coating, Sample Cutting and Polishing, Solid-Phase and Solvent-Based Extraction, Chemical Purification

Electrochemistry

Electrochemical Exfoliation, Electrochemical Graphene Synthesis, Cyclic Voltammetry, Chronoamperometry, Electrochemical Impedance Spectroscopy, Graphene Quantum Dot Electrochemical Synthesis

Laboratory Operations

SOP Development and Standardization, Hazard Assessment and Risk Identification, Chemical Inventory and Storage Management, Instrument Calibration, Maintenance and Troubleshooting, Quality Control Documentation, Audit-Ready Record Keeping, Laboratory Safety Inspections, PPE Compliance, Procurement and Resource Planning

Data Analysis and Software

OriginPro (Raman peak fitting, multi-Lorentzian models, ALS baseline correction), Python (AI-assisted: data processing, spectral analysis, matplotlib visualization), Microsoft Office Suite (Excel automation, PowerPoint generation), ImageJ, NanoScope Analysis, ACD Labs, MNova

Scientific Computing and Digital Tools

AI-Assisted Python Scripting: Raman spectral fitting, data visualization, automated report generation; LLM Workflows (Claude, ChatGPT, Gemini): literature review, data synthesis, scientific writing support; HTML/JavaScript: interactive data tools and scientific dashboards; Excel Automation: multi-sheet workbooks, computed quality metrics, conditional formatting; PowerPoint Automation: programmatic slide generation from experimental datasets; Scientific Infographic and Web Design: brand-aligned technical communications

Scientific Communication and Documentation
Peer-Reviewed Manuscript Writing and Editing, Technical Report Writing, Grant Reporting and Compliance Documentation, Scientific Data Visualization (Canva, PowerPoint), Proposal Development Support, Conference Presentations and Posters

SOFT SKILLS

Critical Thinking and Problem Solving | Attention to Detail and Analytical Rigour | Experimental Design and Scientific Judgement

Researcher Mentoring and Training | Interdisciplinary Collaboration | Cross-Cultural Communication

Project and Priority Management | Independent Work and Self-Direction | Adaptability in Fast-Paced Environments

Technical Communication for Non-Specialist Audiences | Scientific Peer Review | Continuous Improvement Mindset

PROFESSIONAL EXPERIENCE

R&D Materials Chemist, Mitacs Accelerate Fellow
Dec 2023 – Present

Dark Matter Materials Inc. | Edmonton, AB

- Lead catalyst development and optimization for clean hydrogen generation, designing and executing systematic experimental campaigns to evaluate catalyst composition, reaction parameters, and process performance.
- Perform hands-on materials characterization using XRD, FTIR, SEM/EDX, TEM, Raman spectroscopy, and TGA to assess catalyst structure, surface morphology, elemental composition, and performance.
- Conduct electrochemical graphite exfoliation research using varied electrolyte systems, including Raman spectral analysis (D, G, 2D, D', D3 bands) and interpretation of ID/IG, I2D/IG, and ID/ID' ratios.
- Led in-house production scale-up of graphene oxide from laboratory bench to manufacturing scale, achieving approximately 87% cost reduction while maintaining material quality, enabling commercialization of the product.
- Lead SOP development, hazard assessments, and documentation standardization, ensuring safe, reproducible, and audit-ready laboratory operations compliant with Federal and Provincial regulations.
- Manage procurement of laboratory materials and equipment, coordinating with suppliers and internal teams to ensure timely delivery within budget and project constraints.
- Prepare technical reports, scientific data visualizations, and structured documentation for Mitacs, industry partners, funding agencies, and investors.
- Apply AI tools to research workflows including literature synthesis, data analysis, and scientific writing — used exclusively for language, structure, and clarity, with no proprietary data or confidential IP disclosed to external platforms.
- Developed AI-assisted Python scripts for multi-technique spectral analysis (Raman, FTIR, XPS) including peak fitting, baseline correction, automated ratio calculations, and publication-quality data visualization — reducing manual processing time significantly across large multi-sample datasets.
- Built interactive web-based laboratory tools including a graphene exfoliation experiment tracker (HTML/JavaScript, CSV import/export, automated quality scoring) and a browser-based spectral plotting tool, improving data management and team accessibility.
- Designed scientific infographics, product portfolio sheets, and technical communications materials using HTML/CSS and LLM-assisted workflows, supporting business development and investor engagement.

Nanomaterials Characterization Scientist, Postdoctoral Researcher
May 2019 – Dec 2022

University of Alberta / National Research Council | Edmonton, AB

- Conducted advanced structural, optical, and chemical characterization of graphene quantum dots using Raman spectroscopy, TEM, UV-Vis absorption spectrometry, photoluminescence spectroscopy, XRD, FTIR, TGA, BET, and NMR.
- Discovered fundamental structure-property relationships in graphene quantum dots, contributing to high-impact publications in nanomaterials and optoelectronics.
- Developed and tested graphene-based field-effect transistors (GFETs) using advanced clean-room fabrication techniques including thin film deposition, ALD, and spin coating.

- Collaborated with interdisciplinary teams across engineering, physics, and materials science to construct and test optoelectronic devices.
- Mentored graduate and undergraduate researchers in experimental planning, analytical methods, data interpretation, and scientific writing.
- Maintained compliance with NRC and UAlberta institutional safety standards, SOPs, and quality control requirements across all laboratory activities.

Carbon Nanomaterials Researcher and Materials Chemist May 2013 – Apr 2019
Carbon and Ceramic Materials Laboratory, UFES | Brazil

- Led R&D projects on graphene-based and carbon nanomaterial synthesis, characterization, and application across energy storage, optical engineering, electrochemistry, and forensic science.
- Performed quantitative characterization using XRD, FTIR, Raman, SEM/EDX, TEM, TGA, BET, and solid-state NMR, developing expertise in structure-property analysis of carbon-based materials.
- Developed and validated experimental protocols, analytical methods, calibration standards, and extraction procedures across multiple interdisciplinary research initiatives.
- Collaborated with researchers across chemistry, physics, electrical engineering, and forensic science, contributing to 5+ interdisciplinary projects.
- Trained and supervised 4 graduate and undergraduate students in laboratory techniques, safety protocols, SOP adherence, and scientific communication.
- Authored and co-authored 12 peer-reviewed publications in high-impact journals across materials science, energy storage, electrochemistry, optical engineering, and forensic science.

EDUCATION

Ph.D. in Chemistry – Materials Science Apr 2015 – Dec 2018
Universidade Federal do Espirito Santo (UFES) | Brazil

M.Sc. in Chemistry – Materials Science Mar 2013 – Mar 2015
Universidade Federal do Espirito Santo (UFES) | Brazil

B.Sc. in Chemistry – Organic Chemistry Mar 2009 – May 2013
Universidade Federal do Espirito Santo (UFES) | Brazil

International credential evaluation completed through World Education Services (WES).

PUBLICATIONS

12 peer-reviewed publications and book chapters. Listed in reverse chronological order.

- Vieira, M. A. et al. Phosphorus/Sulfur-Enriched Reduced Graphene Oxide Papers Obtained from Recycled Graphite: Solid-State NMR Characterization and Electrochemical Performance for Energy Storage. C – Journal of Carbon Research, 9(2), 60, 2023. DOI: 10.3390/c9020060
- Costa, T. L. G., Vieira, M. A. et al. Combined computational and experimental study about the incorporation of phosphorus into the structure of graphene oxide. RSC Physical Chemistry Chemical Physics, 25, 2023. DOI: 10.1039/D2CP03666E
- Wang, H., Arpini Vieira, M. et al. Graphene Quantum Dot Bearing Liquid Droplets for Ultrasensitive Fluorescence-Based Detection of Nitroaromatics. ACS Applied Nano Materials, 2022. DOI: 10.1021/acsanm.2c03005
- Goncalves, G. R., Vieira, M. A. et al. Synthesis of iron phosphide nanoparticles dispersed in activated carbon and their application in Fenton processes. Journal of Nanoparticle Research, 24(193), 2022. DOI: 10.1007/s11051-022-05562-9
- Aghajamali, M., Arpini Vieira, M. et al. Synthesis and Properties of Multi-Functionalized Graphene Quantum Dots with Tunable Photoluminescence and Hydrophobicity from Asphaltene and Its Oxidized and Reduced Derivatives. Nanoscale Advances, 2022. DOI: 10.1039/D2NA00445C
- Vieira, M. A. Fabrication and Implementation of Nanomaterials-Assisted Flexible Sensors. Chapter 4 in: Flexible Sensors for Energy-Harvesting Applications. Springer, 2022. DOI: 10.1007/978-3-030-99600-0
- Silva, L. C. B., Vieira, M. A. et al. Stable dark pulses produced by a graphite oxide saturable absorber in a fiber laser cavity. Applied Optics, 58(33), 2019. DOI: 10.1364/AO.58.009297

- Silva, L. C. B., Vieira, M. A. et al. All-Fiber Erbium-Doped Q-Switched Laser With Recycled Graphite Oxide. IEEE Photonics Technology Letters, 31(21), 2019. DOI: 10.1109/LPT.2019.2943252
- Girelli, C. M. A., Vieira, M. A. et al. Recovery of latent fingermarks from brass cartridge cases: Evaluation of developers, analysis of surfaces and internal ballistic effects. Forensic Science International, 290, 2018. DOI: 10.1016/j.forsciint.2018.07.026
- Vieira, M. A. et al. Solid state 13C NMR study on the synthesis of graphite oxide from different graphitic precursors. Quimica Nova, 40, 2017. DOI: 10.21577/0100-4042.20170129
- Vieira, M. A. et al. Synthesis of graphite oxide from milled graphite studied by solid-state 13C nuclear magnetic resonance. Carbon, 98, 2016. DOI: 10.1016/j.carbon.2015.11.037
- Gilles, V., Vieira, M. A. et al. A new, simple and efficient method of Steglich esterification of juglone with long-chain fatty acids: synthesis of a new class of non-polymeric wax deposition inhibitors for crude oil. Journal of the Brazilian Chemical Society, 26, 2015. DOI: 10.5935/0103-5053.20140216

PROFESSIONAL SERVICE

Scientific Manuscript Reviewer, Elsevier and MDPI journals (ongoing)

- Volunteer peer reviewer evaluating submitted manuscripts across materials science and related disciplines for methodological soundness, clarity, and adherence to publication standards.

CERTIFICATIONS AND TRAINING

- WHMIS 2015 – Certified (2026)
- World Education Services (WES) – Verified International Academic Qualifications
- Project Management Simplified

LANGUAGES

English – Native/Bilingual
Portuguese – Native/Bilingual