SANTIAGO D. BARRIONUEVO

Postdoctoral Researcher | Graphene R&D, Process Development & Device Integration
CVD Graphene | 2D Materials | Cleanroom Fabrication | Advanced Characterization
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SUMMARY

PhD in Engineering, Electronic Engineer and graphene specialist with 8+ years of hands-on R&D experience translating graphene-based materials into device-oriented technologies. Experience covers CVD graphene synthesis, 2D material transfer, cleanroom microfabrication, graphene/device integration, advanced microscopy/spectroscopy, Python/data analysis and technical reporting.
Target fit: Graphene R&D, process development, wafer/device integration, advanced metrology, quality control, failure analysis and prototype fabrication.

CORE VALUE FOR GRAPHENE INDUSTRY

- **Full graphene value chain:** I work across the whole production chain from CVD growth, transfer, heterostructure assembly, cleanroom patterning, device integration, characterization trough data interpretation and results dissemination. I work with CVD graphene, twisted bilayer graphene (TBLG), graphene quantum dots (GQDs), carbon quantum dots (CQDs) and graphene/metal nanohybrids. But also, other 2D materials (e.g.: MoS2, hBN…).
- **Outcome-oriented R&D:** I can connect process variables, defects, contamination, interfaces and spectroscopy/microscopy to put in evidence device-relevant performance and process problems in order to optimize the production chain.
- **Measurable track record:** I contributed to several EU H2020 projects integrating graphene and other 2D materials into the value chain of device fabrication . I worked in MELON (memristive/neuromorphic materials) and in ULTIMATE-I (spintronics/advanced sensing). Taking on graphene integration responsibilities; secured 3 competitive ELECMI singular facility accesses; and produced 10 research outputs linked to graphene/materials science in the same span of time.

WORK AND RESEARCH EXPERIENCE

INMA (CSIC/UNIZAR) **Sep. 2024 - Jul. 2026**

Postdoctoral Research Fellow / Early Researcher, H2020 MSCA-RISE **Zaragoza, Spain**

- **Graphene/device integration:** Delivered tasks for ULTIMATE-I and MELON on graphene based nanomaterials and heterostructures (combining with MoS2 and YIG) worked on synthesis, characterization, device integration and simulation under Dr. Myriam H. Aguirre supervision.
- **Cleanroom/process work:** Worked on 2D material transfer, lithography-based device preparation, sputtering, ion milling and Hall-bar/GFET-oriented workflows; documented process steps and failure modes for reproducibility.
- **Competitive facility access:** Secured 3 ELECMI grants in 2025/2026: TEM-EELS on TBLG using NEOARM cFEG TEM at CCiT-UB and two UHV low-temperature JT-STM/STS campaigns at LMA Zaragoza.
- **Characterization and process feedback:** Combined Raman, SEM, STM/STS, HRTEM, STEM-HAADF, EELS, XPS, UV-Vis and FTIR data to connect structure, defects and interfaces with performance and overall quality of materials.
- **Interdisciplinary and international team work:** Coordinated sample preparation, proposal writing, measurement planning, post-processing and interpretation with facility staff and collaborators both in Spain and Argentina. I teach and also had on my charge several engineers and students, both from masters and bachelor.

INIFTA (CONICET-UNLP) **Apr. 2018 - Aug. 2024**

Doctoral Research Fellow - Graphene-Derived Nanomaterials & Devices **Buenos Aires, Argentina**

- **CVD graphene platform:** Designed, assembled, maintained and operated custom CVD equipment for graphene growth on Cu foils and Ni foams; used 2D/3D graphene as a platform for TBLG, GQDs, CQDs and graphene/metal nanohybrids.
- **Process improvement:** Developed CVD process-control/sensing routines; prior resume record reports ~70% shorter synthesis duration through automation and parameter control.
- **Twisted bilayer graphene:** Developed synthesis/transfer protocols to obtain TBLG from CVD graphene on Cu through substrate chemical attack, enabling rotation-angle-dependent electronic structure tuning.
- **Device-relevant applications:** Advanced graphene-derived materials for Hg2+/Fe3+ fluorescence sensing, water/wine analysis, photoanodes, dye photodegradation, electrocatalysis, glucose sensing and Au/Pt core-shell nanohybrids.
- **Modeling and analysis:** Built TDDFT/DFT/Python workflows to simulate GQD absorption/emission, interpret quantum confinement, compare with spectroscopy and guide material design.

TECHNICAL SKILLS

Graphene & 2D	CVD graphene; TBLG; graphene quantum dots; carbon quantum dots; graphene foams; vdW heterostructures; GQD/Au/Pt nanohybrids; graphene/YIG device stacks; MoS2-related integration.
Process & Fab	CVD growth; wet transfer; substrate chemical attack; cleanroom processing; direct-write photolithography; sputtering; ion milling; Hall-bar/GFET device layouts; troubleshooting and SOP-style documentation.
Characterization	Raman; SEM; AFM; HRTEM; STEM-HAADF; EELS; STM/STS; XPS; UV-Vis; FTIR; electrochemical and optoelectronic measurements; quality/failure analysis.
Data / Simulation	Python; MATLAB; C/C++; ORCA; Quantum ESPRESSO; TDDFT/DFT; AI-assisted simulation; data cleaning; plotting; process data interpretation; technical reporting.
Industry Methods	DoE-aware experimental planning; root-cause troubleshooting; process documentation; sample traceability; cross-functional collaboration with facilities, PIs and technical staff.

GRAPHENE-ORIENTED CONTRIBUTIONS, OUTPUTS & COMMUNICATION

- Support CVD graphene growth, transfer, cleaning, patterning and device-integration workflows for graphene-based wafers, heterostructures and prototype devices.
- Use Raman, SEM, AFM, electrical measurements, STM/STS, EELS, XPS and electron microscopy to diagnose defects, contamination, interfaces, crystallinity and reproducibility issues.
- Translate research protocols into process documentation, sample traceability, test matrices and data-driven troubleshooting workflows for R&D, process, quality and graphene foundry environments.
- Produced 10 graphene/materials research outputs, including first-author or co-first-author papers in Chemistry, Journal of Physical Chemistry C and Journal of Materials Chemistry C.
- Contributed to applied materials publications on fluorescent sensing, machine-learning-assisted detection, graphene/metal nanohybrids, electrocatalysis and electrochemical devices.
- Presented TBLG/graphene results at Graphene2025, E-MRS 2025, LT30, GEFES 2025 and AMatS 2025.
- Teaching Assistant in Nanotechnology & Nanomaterials at UNLP; contributed to postgraduate training, student supervision and educational material on graphene and 2D nanomaterials.

SELECTED PROJECTS, FUNDING & IMPACT

- **ULTIMATE-I H2020 MSCA-RISE (EUR 1.656M):** Working team member/seconded researcher at INMA (CSIC/UNIZAR); graphene-based quantum materials, device integration and advanced sensing systems.
- **MELON H2020 MSCA-RISE (EUR 1.380M):** Seconded researcher at INMA; ultra-clean graphene layers and hybrid Au/Pt-graphene nanostructures for sensing/electrochemical platforms.
- **ELECMI facility campaigns:** Led proposal drafting and experiment planning for TEM-EELS (NEOARM, CCiT-UB) and low-temperature UHV JT-STM/STS (LMA Zaragoza) applied to TBLG, GQDs and graphene nanoribbons.
- **Research output:** 10 research outputs, including 9 peer-reviewed papers and 1 education-oriented preprint; 3 first-author graphene papers; 101 citations, h-index 7 and i10-index 5 in the Apr. 2026 CVN/Google Scholar record.
- **National funding and awards:** CONICET doctoral fellowship (60 months), CONICET postdoctoral fellowship (up to 36 months), PICT/FONCYT/ANPCyT projects, INNOVAR 2017 and PREMIOS INNOVACION UNLP 2017.

EDUCATION, CERTIFICATIONS & LANGUAGES

- **Doctorate in Engineering, Materials Engineering** - Universidad Nacional de La Plata, Argentina | PhD awarded Jul. 2024 | Thesis: TBLG, GQDs and graphene-metal nanohybrids for advanced applications.
- **Electronic Engineering** - Universidad Nacional de La Plata, Argentina | 2017; Electronic Technician - Technical High School EPT No. 748, Trelew, Argentina | 2011.
- **Digital/data training:** Google Data Analytics; Python for Data Science, AI & Development; R Data Analysis; AI-assisted simulation and scientific software workflows.
- **Languages:** Spanish native; English professional working proficiency; experience writing proposals, reports, manuscripts and technical documentation in international teams.

APPLIED & TECHNICAL GRAPHENE PORTFOLIO

- **CVD graphene as manufacturing platform:** Cu-foil and Ni-foam growth routes used as precursors for TBLG, GQDs/CQDs and graphene-metal nanohybrids.
- **Device integration exposure:** graphene/YIG stacks, Hall-bar/GFET-oriented layouts, metal deposition/patterning and interface-aware characterization for spintronic and neuromorphic platforms.
- **Process-to-property analysis:** linked growth/transfer history, spectroscopy, microscopy, electrochemistry and simulations to explain optical/electronic behavior and material reliability.
- **Sector fit:** strongest value for process engineering, application engineering, device prototyping, advanced metrology, quality/failure analysis and customer-facing technical reporting.
- **CVD graphene:** Cu foil and Ni foam growth routes; 2D/3D graphene as precursor for TBLG, GQDs/CQDs and graphene-metal nanohybrids.
- **Device integration:** graphene/YIG stacks, Hall-bar/GFET-oriented layouts, metal deposition, patterning and interface-aware characterization.
- **Advanced metrology:** FFT/STM/STS, EELS, Raman, XPS and electron microscopy used to validate crystallinity, defects, chemical speciation and edge/interface behavior.
- **Computational support:** TDDFT/DFT and Python workflows used to link structure, spectroscopy and electronic/optical properties in graphene quantum dots and TBLG.