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Pedro Brandimarte

Curriculum Vitae

Education

2008–2014 **Ph.D. in Physics**, *Universidade de São Paulo*, USP, Brazil.

2002–2007 **Bachelor in Physics**, *Universidade de São Paulo*, USP, Brazil.

Complementary Education

2009–2014 **Bachelor in Applied and Computational Mathematics**, *Universidade de São Paulo*, USP, Brazil. Concluded 65% of the courses (1350h).

PhD Thesis

Title *Study of the Influence of Localized Vibrational Modes in Charge Transport Properties at Nanoscale Systems*

Grant National Council of Technological and Scientific Development (CNPq) - 142792/2010-1 (2010–2014)

Supervisors Prof. Antônio José Roque da Silva

Prof. Alexandre Reily Rocha

Description The main objective of the thesis was to study the charge transport properties at the nanoscale considering the effect of inelastic scattering of electrons by interacting with phonons. The developed work can be seen as an implementation project of different integrated tools for this purpose. Different approaches were used resulting in different computational implementations, allowing the simulation of inelastic transport by first principles, including disordered systems.

Work Experience

Postdoctoral Researcher

2019–Present **Donostia International Physics Center - DIPC**, *Spain*.
Electronic structure, magnetism, and quantum transport in graphene nanostructures.
funding: European Commission, Horizon 2020 (SPin Research IN Graphene - SPRING, H2020-EU.1.2.1., FET Open project, contract 863098)

2017–2019 **Donostia International Physics Center - DIPC**, *Spain*.
Electronic structure and quantum transport in graphene-based nanostructures and networks.
funding: DIPC Foundation (contract E-20-2017-0189529)

2015–2017 **Centro de Física de Materiales - CFM**, *Spain*.
Development of tools and theoretical models for studying electron transport in planar atomic and molecular scale devices.
funding: European Commission, 7o Framework Programme (Planar atomic and molecular scale devices - PAMS, C-ICT/3280, ICT Collaborative project, contract 610446)

Scientific Training

2006–2007 **European Organization for Nuclear Research - CERN**, *Switzerland*, Scientific training at ALICE (A Large Ion Collider Experiment).
Development on the AliRoot framework for simulation at the ALICE Off-line group (950h).
funding: European Commission, programme América Latina - Formación Académica (ALFA)

2004–2005 **Universidade de São Paulo**, *Brazil*, Scientific training at Coherent Manipulation of Atoms and Light Laboratory.
Magneto-optical trap experiment under the supervision of Prof. Paulo A. Nussenzveig.
funding: National Council of Technological and Scientific Development (CNPq) / Institutional Scholarship Program for Scientific Initiation (PIBIC) - 112144/2004-7

Supervision

2019 **Donostia International Physics Center - DIPC**, *Spain*, Supervisor.
Electronic properties and tight-binding parametrization of twisted bi-layer graphene.
student: Itsaso Blanco, University College London, Faculty of Maths and Physical Sciences.

2019 **Donostia International Physics Center - DIPC**, *Spain*, Co-supervisor.
Simulations of wave package dynamics in graphene-based materials.
student: Asier Rodríguez, Universidad del País Vasco, Departamento de Física.

2018 **Donostia International Physics Center - DIPC**, *Spain*, Supervisor.
Scientific Training on bond order of graphene-based nanostructures.
student: Amaia Juaristi Arrizabalaga, Universidad del País Vasco, Departamento de Matemáticas.

2018 **Donostia International Physics Center - DIPC**, *Spain*, Co-supervisor.
Scientific Training on quantum transport in nanoscale devices.
student: Biel Martinez Diaz, Universitat de Barcelona, Facultat de Química.

Teaching

2004–2005 **Universidade de São Paulo**, *Brazil*, Instructor.
Experimental Physics III and IV.

Volunteer

2008 **Educafro**, *Cohab de Taipas and Cohab Brasilândia*.
Teacher of physics and mathematics.

2001 **A. A. Criança**, *Associação de Apoio às Meninas e Meninos da Região Sé*.
Assistance to children and young people living on the streets.

Research projects and grants

2018–2020 **A Novel Platform for Electronics and Quantum Electron Optics Based on Graphene Nanostructures (GRANAS)**.
grant: Spanish Ministry of Economy, Industry and Competitiveness (FIS2017-83780-P)

2010–2014 **Study of the Influence of Localized Vibrational Modes in Charge Transport Properties at Nanoscale Systems**.
grant: National Council of Technological and Scientific Development - CNPq (142792/2010-1)

2006–2007 **ALICE (A Large Ion Collider Experiment) through the HELEN project (High-Energy physics Latin-American European Network)**.
grant: HELEN program (High Energy Latin American Network)

2004–2005 **Vacuum Quantum Noise Squeezing by Polarization Self-rotation**.
grant: National Council of Technological and Scientific Development - CNPq (112144/2004-7)

Bibliographical Production

Author of **9** publications in high-quality peer-reviewed journals, **5 as first theory author**: average impact factor **7.88**. **First theory author** in **4** publications currently under review.

Articles Published in Scientific Journals

1 M. Kolmer, P. Brandimarte*, J. Lis, R. Zuzak, S. Godlewski, H. Kawai, A. García-Lekue, N. Lorente, T. Frederiksen, C. Joachim, D. Sánchez-Portal and M. Szymonski. "Electronic transport in planar atomic-scale structures measured by two-probe scanning tunneling spectroscopy", *Nat. Commun.* **10**, 1573 (2019).

2 R. Zuzak, J. Castro, P. Brandimarte, M. Engelund, A. Cobas, P. Piatkowski, M. Kolmer, D. Pérez, E. Guitian, M. Szymonski, D. Sánchez-Portal, S. Godlewski and D. Peña. "Building a 22-ring nanographene by combining in-solution and on-surface synthesis", *Chem. Commun.* **54**, 10256-10259 (2018).

3 L. Pedroza, P. Brandimarte, A. Rocha, and M. Fernández-Serra. "Bias-dependent local structure of water molecules at a metallic interface", *Chemical Science* **9**, 62-69 (2018).

4 E. Carbonell-Sanromà, A. García-Lekue, M. Corso, G. Vassuer, P. Brandimarte, J. Lobo-Checa, D. de Oteyza, J. Li, S. Kawai, S. Saito, S. Yamaguchi, E. Ortega, D. Sánchez-Portal, and J. Pascual, "Electronic Properties of Substitutionally Boron-Doped Graphene Nanoribbons on a Au(111) Surface", *J. Phys. Chem. C* **122**(28), 16092-16099 (2018).

5 P. Brandimarte, M. Engelund, N. Papior, A. García-Lekue, T. Frederiksen, and D. Sánchez-Portal, "A tunable electronic beam splitter realized with crossed graphene nanoribbons", *J. Chem. Phys.* **146**, 092318 (2017).

6 E. Carbonell-Sanromà, P. Brandimarte, R. Balog, M. Corso, S. Kawai, A. García-Lekue, S. Saito, S. Yamaguchi, E. Meyer, D. Sánchez-Portal, and J. Pascual, "Quantum Dots Embedded in Graphene Nanoribbons by Chemical Substitution", *Nano Lett.* **17**(1), 50-56 (2017).

7 E. Carbonell-Sanromà, J. Hieulle, M. Vilas-Varela, P. Brandimarte, M. Iraola, A. Barragán, J. Li, M. Abadia, M. Corso, D. Sánchez-Portal, D. Peña, and J. Pascual, "Doping of Graphene Nanoribbons via Functional Group Edge Modification", *ACS Nano* **11**(7), 7355-7361 (2017).

8 M. Engelund, N. Papior, P. Brandimarte, T. Frederiksen, A. García-Lekue, and D. Sánchez-Portal, "Search for a Metallic Dangling-Bond Wire on n-Doped H-Passivated Semiconductor Surfaces", *J. Phys. Chem. C* **120**(36), 20303-20309 (2016).

9 C. Villegas, P. B. Mendonça, and A. Rocha, "Optical spectrum of bottom-up graphene nanoribbons: towards efficient atom-thick excitonic solar cells". *Scientific Reports* **4**, 6579 (2014).

Complete Works Published in Conference Proceedings

Z. Guimarães-Filho, L. Mariano, P. B. Mendonça, A. Faro, and R. Malaquias. "Aprendendo física com o uso de experimentos de grande precisão em laboratórios didáticos: o estudo da queda de um corpo". In: *XVI Brazilian Symposium on Physics Teaching - SNEF*, Anais do XVI snef, Rio de Janeiro - Brazil (2005).

Commission of trust

Reviewer for scientific journals (including *ChemistrySelect*, *Physica Status Solidi*, *The Journal of Physical Chemistry* and *Journal of Physics. Condensed Matter*).

Conferences, Scientific Meetings and Workshops

Attended and presented work in scientific conferences/workshops worldwide (Germany, Hong Kong, USA, Spain and Brazil), whose complete list can be found at my *lattes* curriculum (`http://lattes.cnpq.br/8885012919924529`).

Slides and posters I presented can be found on my personal website: `https://brandimarte.github.io`

Organization of international congresses

Towards reality in modelling of molecular electronics (TRMME), Donostia - San Sebastián, June 13-17, 2016, `http://trmme.dipc.org`.

Computational skills

Programming languages and parallel computing

Advanced	Python, C/C++, Fortran, MPI, shell script
Intermediate	R, Octave/MATLAB, OpenMP
Basic	Java, Ruby, Lua, CUDA

Academic Simulation Codes Development (most relevant)

1. Main developer of **PhOnonS ITeratIVE VIBRATIONS** code (`https://github.com/brandimarte/vibrations`) for vibrational and electron-phonon coupling analysis via first-principles. [C, shell]
2. Developer of **Inelastic SMEAGOL** code (`https://bitbucket.org/brandimarte/smeagol-2.0` - closed access) for *ab initio* inelastic electronic transport of atomic scale devices. [Fortran95, MPI, OpenMP]
3. Main developer of **Inelastic Disorder** code (`https://github.com/brandimarte/idisorder`) for transport on devices with random defects and inelastic scattering. [Fortran95, C++, MPI, CUDA]
4. Main developer of **KPM** code (`https://github.com/brandimarte/kpm`), a kernel polynomial method implementation using Chebyshev expansion for disordered lattices. [Fortran95, MPI]
5. Main developer of **MCMCneuro** code (`https://github.com/brandimarte/MCMCneuro`), a data driven graph model for neuronal interactions using Bayesian statistics and Markov Chain Monte Carlo. [C, shell, R]
6. Contributor of **SIESTA/TranSIESTA** codes (`https://gitlab.com/siesta-project`) for *ab initio* electronic structure and transport simulations. [Fortran, MPI, OpenMP]
7. Contributor of **Inelastica** code (`https://github.com/tfrederiksen/inelastica`), a Python package for electronic structure and transport calculations based on SIESTA/TranSIESTA DFT codes. [Python]

Languages

Portuguese	Mother Tongue	
English	Fluent	*Understand well, speak well, read well, write well*
Spanish	Advanced	*Understand well, speak well, read well, write reasonably*
French	Intermediate	*Understand well, speak reasonably, read well, write reasonably*