

## Murillo Longo Martins

**Birth:** 23/08/1986 – Goiânia - GO - Brazil

**Contact:** longomartiml@ornl.gov / murillolongo@gmail.com

**Current professional address:** Neutron Scattering Division, Oak Ridge National Laboratory, P.O. Box 2008 MS6455, Oak Ridge, Tennessee 37831, United States



### Career summary

I have a BS degree in medical physics, a master's in materials science, and a double-degree doctorate in materials science and condensed matter physics. Over the years, I have been working to develop a broad academic profile with experiences in teaching and multidisciplinary research. My main research interests are the study of the dynamics of fluids and macromolecules as bulk and under confinement (in biological and non-biological systems) and the development and applications of organic and inorganic nanoparticles combined with biologically relevant molecules. In all these areas, I have been working with chemical syntheses of micro and nanomaterials and several characterization techniques including thermal analysis, scattering of light, X-rays, and neutrons, and others.

### Education

- 2015 Double degree Doctorate/Ph.D.: Materials Science and Technology, São Paulo State University, Brazil / Condensed Matter Physics, University of Copenhagen, Denmark
- 2011 Master in Materials Science and Technology, São Paulo State University, Brazil
- 2008 Bachelor in Medical Physics, São Paulo State University, Brazil

### Positions

- Since 2019 Postdoctoral fellow – Oak Ridge National Laboratory, Neutron Sciences Division, USA
- 2017 - 2019 Researcher (Regional Scientific Development Program) - Pontifical Catholic University, Brazil
- 2016 - 2017 Lecturer - University Center of Anápolis, Brazil
- 2015 - 2016 Guest researcher – University of Copenhagen, Denmark

## **Bibliographic overview**

16 publications (14 as first and/or correspondent author) in international refereed journals and 2 general-interest publications. A complete list of publications is presented in Appendix A.

## **Research summary**

In my MSc project, I mostly worked with magnetic ferrites synthesized via sol-gel-based routes. Among other techniques, these materials were investigated via X-ray diffraction experiments followed by Rietveld refinement, including anomalous scattering. Then, in my Ph.D. studies, the main goal was to develop a nanocomposite for applications related to breast cancer. The resulting material was formed by a core of magnetic nanoparticles, a polymeric coating modified with hydroxyapatite nanocrystals, and an encapsulated chemotherapy drug. In addition to characterizing this material with several traditional techniques (thermal analyses, infrared and Raman spectroscopies, etc), we combined NEXAFS/STXM with neutron scattering experiments to explain how the action of the encapsulated drug was diminished in healthy cells. As a guest researcher at the University of Copenhagen, I focused on using quasielastic and inelastic neutron scattering to investigate anesthetic drugs complexed with dextrin. Also, during this time, a new project was initiated aiming to understand how chemotherapy drugs affect the water dynamics in cancer cells. To this date, this project has been conducted with a combination of thermal analysis, neutron scattering, and dielectric spectroscopy. At the Pontifical Catholic University in Brazil, I was among 24 young scientists who were selected to promote scientific culture in less traditional institutions in my home state. Despite the infrastructure-related challenges, I have performed a research project focused on the combination of hydroxyapatite nanoparticles with chemotherapy drugs and other biologically relevant molecules. Finally, as a postdoc at SNS, I have been involved in a series of projects where the transport properties of electrolytes are investigated via quasielastic neutron scattering in combination with other techniques. Namely, we have been investigating the dynamic behavior of solvent-in-salt electrolytes (bulk and confined), water confined in MXenes, and ionic liquids as bulk and confined in quasi-liquid solid electrolytes.

## **Pedagogical training**

- 2013 Teaching trainee during the Neutron Scattering course at the University of Copenhagen, Denmark (30h)
- 2012 Teaching trainee during the Molecular Biophysics course at the São Paulo State University, Brazil (34h)
- 2011 Postgraduate (specialization) in mathematics and physics teaching, University International Center, Brazil

## **Teaching track record:**

2016 Lecturer in the Civil Engineering BSC course, University Center of Anapolis, Brazil: Basic Physics 1, Basic Physics 2, Applied Electricity, and Applied Mechanics.

### **Students supervision:**

1. João Paulo Ruiz Lucio de Lima Parra (ongoing PhD project at the São Paulo State University, Brazil. Co-supervisor 50%).
2. Nikolaos Giannoulis (ongoing MSc project at the University of Copenhagen, Denmark. Co-supervisor 20%)
3. Solveig Hedal (MSc dissertation at the University of Copenhagen, Denmark. Co-supervisor 10%)
4. Rosanna Ignazzi (BSc student at the University of Copenhagen, Denmark. Co-supervisor 20%)
5. João Paulo Ruiz Lucio de Lima Parra (BSc student at the São Paulo State University, Brazil. Co-supervisor 50%).

### **Conferences**

29+ conference presentations and posters at international conferences, meetings, and workshops.

### **Awards, honors, and personal fellowships:**

- 2019 Humboldt foundation (Germany) / Brazilian Government grant for a postdoctoral project (full salary for 2 years + 20,000€ for research costs).
- 2017 Brazilian Government / Goias State grant for Regional Scientific Development Program (full salary for 3 years + 40,000 R\$ for research costs).
- Since 2013 Several scientific highlights from institutions in Denmark, Sweden, and the UK
- 2013 Best work at the Neutrons and Life Science Symposium, European Spallation Source, Lund, Sweden.
- Since 2011 Several proposals submitted as PI have been accepted to perform different experiments in large-scale facilities (LNLS, PSI, SNS, ISIS, etc). I have also been the PI of experiments performed via the European Union's Horizon 2020 research and innovation program (EUSMI).
- 2007 - 2015 Brazilian Government Fellowships for outstanding young scientists including stipends as a BSc student, MSc and Ph.D. salaries, and 1 year of full salary as a guest researcher at the University of Copenhagen, Denmark. In all these cases, I was the main responsible for the proposal writing.

### **Management experience, including participation in conferences organization**

- 2016 Member of the board of creation of new graduate programs at the University Center of Anapolis, Brazil.
- 2015 Member of the organization committee of the Fifth Annual Niels Bohr International Academy Workshop-School on ESS Science (University of Copenhagen, Denmark).
- 2014 Member of the organization committee of the Fourth Annual Niels Bohr International Academy Workshop-School on ESS Science (University of Copenhagen, Denmark).

### **Service to profession**

Peer-review for scientific journals, including Scientific Reports, ACS Applied Materials & Interfaces, Langmuir, Vibrational Spectroscopy, Journal of Materials Science, International Journal of Molecular Sciences, etc.

### **Languages**

- Portuguese (mother tongue)
- English (fluent)
- Spanish (intermediate)
- German (very basic knowledge)

## APPENDIX A

### Murillo Longo Martins

**Birth:** 23/08/1986 – Goiânia - GO - Brazil

**Contact:** longomartiml@ornl.gov / murillolongo@gmail.com

**Current professional address:** Neutron Scattering Division, Oak Ridge National Laboratory, P.O. Box 2008 MS6455, Oak Ridge, Tennessee 37831, United States

#### Publications as first/ correspondent author

1. BRIDGES, C. A.; **MARTINS, M. L.**; JAFTA, C. J.; SUN, X. G.; PARANTHAMAN, M. P.; LIU, J.; DAI, S.; MAMONTOV, E. Dynamics of Emim in [Emim][TFSI]/LiTFSI Solutions as Bulk and under Confinement in a Quasi-liquid Solid Electrolyte. **Journal of Physical Chemistry B**, v. **125**, p. **5443-5450**, **2021**.
2. **MARTINS, M. L.**; SACCI, R. L.; SANDERS, N. C.; TYLER, J.; MATSUMOTO, R. A.; POPOV, I.; GUO, W.; DAI, S.; CUMMINGS, P. T.; SOKOLOV, A. P.; MAMONTOV, E. Addition of Chloroform in a Solvent-In-Salt Electrolyte: Outcomes in the Microscopic Dynamics in Bulk and Confinement. **Journal of Physical Chemistry C**, v. **124**, p. **22366-22375**, **2020**.
3. **MARTINS, M. L.**; PINTO, T. S.; GOMES, A. M.; RUIZ L. L. P. J. P.; FRANCHI JR, G. C.; ZAMBUZZI, W. F.; RODRIGUES, C. G. Immobilization of paclitaxel on hydroxyapatite for breast cancer investigations. **Langmuir**, v. **36**, p. **8723-8732**, **2020**.
4. **MARTINS, M. L.**; BORDALLO, H. N.; ARRESE-IGOR, S.; ALEGRIA, A.; COLMENERO de LEON, J. Effect of Paclitaxel in the Water Dynamics of MCF-7 Breast Cancer 2 Cells Revealed by Dielectric Spectroscopy. **ACS Omega**, v. **5**, p. **18602-18607**, **2020**.
5. **MARTINS, M. L.**; DINITZEN, A. B.; MAMONTOV, E.; RUDIC, S.; PEREIRA, J. E. M.; HARTMANN-PETERSEN, R.; HERWIG, K. W.; BORDALLO, H. N. Water dynamics in MCF-7 breast cancer cells: a neutron scattering descriptive study. **Scientific Reports**, v. **9**, p. **8704**, **2019**.
6. **MARTINS, M. L.**; IESSI, I. L.; QUINTINO, M. P.; DAMASCENO, D. C.; RODRIGUES, C. G. Glucose is an active chemical agent on degradation of hydroxyapatite nanostructure. **Materials chemistry and physics**, p. **122166**, **2019**.
7. **MARTINS, M. L.**; ECKERT, J.; JACOBSEN, H.; SANTOS, E. C.; IGNAZZI, R.; DE ARAUJO, D. R.; BELLISSENT-FUNEL, M. C.; NATALI, F.; KOZA, M. M.; MATIC, A.; DE PAULA, E.; BORDALLO, H. N. Probing the dynamics of complexed local anesthetics via neutron scattering spectroscopy and DFT calculations. **International journal of pharmaceutics (PRINT)**, v. **524**, p. **397-406**, **2017**.
8. **MARTINS, M. L.**; ECKERT, J.; JACOBSEN, H.; SANTOS, E. C.; IGNAZZI, R.; DE ARAUJO, D. R.; BELLISSENT-FUNEL, M. C.; NATALI, F.; KOZA, M. M.; MATIC,

- A.; DE PAULA, E.; BORDALLO, H. N. Raman and Infrared spectroscopies and X-ray diffraction data on bupivacaine and ropivacaine complexed with 2-hydroxypropyl- $\beta$ -cyclodextrin. **Data in Brief**, v. **15**, p. **25-29**, 2017.
9. **MARTINS, M. L.**; IGNAZZI, R.; ECKERT, J.; WATTS, B.; KANENO, R.; ZAMBUZZI, W. F.; DAEMEN, L.; SAEKI, M. J.; BORDALLO, H. N. Restricted mobility of specific functional groups reduces anti-cancer drug activity in healthy cells. **Scientific Reports**, v. **6**, p. **22478**, 2016.
  10. **MARTINS, M. L.**; ORECCHINI, A.; AGUILERA, L.; ECKERT, J.; EMBS, J.; MATIC, A.; SAEKI, M. J.; BORDALLO, H. N. Encapsulation of paclitaxel into a bio-nanocomposite. A study combining inelastic neutron scattering to thermal analysis and infrared spectroscopy. **EPJ Web of Conferences**, v. **83**, p. **02011** - , 2015.
  11. **MARTINS, M. L.**; CALABRESI, M. F.; QUINI, C.; MATOS, J. F.; MIRANDA, J. R. A.; SAEKI, M. J.; BORDALLO, H. N. Enhancing the versatility of alternate current biosusceptometry (ACB) through the synthesis of a dextrose-modified tracer and a magnetic mucoadhesive cellulose gel. **Materials Science & Engineering. C, Biomimetic Materials, Sensors and Systems (Print)**, v. **48**, p. **80 - 85**, 2015.
  12. **MARTINS, M. L.**; SAEKI, M. J.; TELLING, M. T. F.; PARRA, J. P. R. L. L.; LANDSGESELL, S.; SMITH, R. I.; BORDALLO, H. N. Development and characterization of a new bio-nanocomposite (bio-NCP) for diagnosis and treatment of breast cancer. **Journal of Alloys and Compounds**, v. **584**, p. **514 - 519**, 2014.
  13. **MARTINS, M. L.**; FLORENTINO, A. O.; CAVALHEIRO, A. A.; SILVA, R. I. V.; DOS SANTOS, D. I.; SAEKI, M. J. Mechanisms of phase formation along the synthesis of Mn-Zn ferrites by the polymeric precursor method. **Ceramics International**, v. **40**, p. **16023 - 16031**, 2014.
  14. **MARTINS, M. L.**; GATES, W. P.; MICHOT, L.; FERRAGE, E.; MARRY, V.; BORDALLO, H. N. Neutron scattering, a powerful tool to study clay minerals. **Applied Clay Science (Print)**, v. **96**, p. **22 - 25**, 2014.

#### **Publications as co-author**

1. ICHIKAWA, R.; PARRA, J. P. R. L. L.; **MARTINS, M. L.**; YOSHITO, W. K.; SAEKI, M. J.; TURRILHAS, X.; MARTINEZ, L. G. Size-Strain Analysis of Iron-Excess Mn-Zn Ferrite Nanoparticles Using Synchrotron Diffraction and Its Correlation with Magnetic Saturation and Isoelectric pH. **Journal of nanoscience and nanotechnology**, v. **18**, p. **5697-5703**, 2018.
2. JORGETTO, A. O.; SILVA, R. I. V.; **LONGO, M. M.**; SAEKI, M. J.; PADILHA, P. M.; MARTINES, M. A. U.; ROCHA, B. P.; CASTRO, G. R. Incorporation of dithiooxamide as a complexing agent into cellulose for the removal and pre-concentration of Cu(II) and Cd(II) ions from natural water samples. **Applied Surface Science**, v. **264**, p. **368 - 374**, 2013.

### **General interest publications**

1. **MARTINS, M. L.**; IGNAZZI, R.; JACOBSEN, H.; DE ARAUJO, D. R.; YOKAICHIYA, F.; SAEKI, M. J.; DE PAULA, E.; BORDALLO, H. N. Encapsulation effects on the structure-dynamics on drug carriers revealed by neutron scattering. **Neutron News**, v.25, p.16 - 19, 2014.
2. **MARTINS, M. L.**; BORDALLO, H. N. Breakthrough magnetic fluid application. **Magnetics Technology International**, v. 3, p. 42, 2013.