

# Curriculum Vitae

## Personal Information

**Name:** Flavio Augusto

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## Current Position

- **(2016 - Present)** Associate Professor at the Department of Physics of the Federal University of Lavras.

## University Education

- **(2009 - 2012)** PhD in Physics at Università di Roma “La Sapienza”, Italy. Thesis entitled “*Aging Investigations of Laponite Systems*”. Supervisors: Barbara Ruzicka (barbara.ruzicka@roma1.infn.it) and Giancarlo Ruocco (giancarlo.ruocco@roma1.infn.it).
- **(2007 - 2009)** Master of Physics at Federal University of Uberlândia, Institute of Physics, Brazil. Thesis entitled “*Electric Field Effects on the Energy Transfer of Self Assembled InAs/GaAs Quantum Dots*”. Supervisor: Adamo Ferreira Gomes do Monte (adamo@infis.ufu.br).
- **(2006 - 2007)** Master de Sciences de la Matière (ENS Lyon) and Laurea specialistica in Fisica (Università di Roma “La Sapienza”), both of them at MSc level, within the European Community programme “Erasmus Mundus - ATOSIM”. Thesis entitled “*Aging Phenomena in a Clay-Polymer System*”. Supervisors: Barbara Ruzicka (barbara.ruzicka@roma1.infn.it) and Giancarlo Ruocco (giancarlo.ruocco@roma1.infn.it).
- **(2002 - 2006)** Graduated in Physics by the Federal University of Uberlândia, Institute of Physics, Brazil. Thesis entitled “*Synthesis and Optical Investigation of Silicate and Fluoride Glasses Doped With  $Tm^{3+}$  and  $Er^{3+}$* ”. Supervisor: Noelio Oliveira Dantas (noelio@ufu.br).

**GPA:** 8.3 (on 1 to 10 scale)

## Post-doctoral Work

- **(2015 - 2016)** Universidade Federal de Minas Gerais (UFMG), Belo Horizonte, Brazil.  
fellowship: Coordination for the Improvement of Higher Education (CAPES).  
Project aim: Investigation of biological systems using microscopy and optical tweezers.
- **(2013 - 2015)** Center for Life Nanoscience (CLNS) at the University of Rome “La Sapienza”, Italy.  
fellowship: Italian Institute of Technology (IIT).  
Project aim: Study arrested mechanisms of biocompatible gels for drug delivery applications.

## Scholarship Awards

- **(2015 - 2016)** Pos-doc scholarship award from the Brazilian Coordination for the Improvement of Higher Education (CAPES), Post-graduation Development Program (PNPD), Brazil.
- **(2009 - 2012)** PhD scholarship award from Università di Roma “La Sapienza” within the Foreign Nationals Educated Abroad (FNEA) program, Italy.
- **(2007 - 2009)** Master scholarship award from the Brazilian Federal Agency for Support and Evaluation of Graduate Education, Brazil.
- **(2006 - 2007)** Erasmus Mundus Scholarship of the European Commission, European Union.
- **(2004 - 2006)** Scientific initiation scholarship supported by the National Council for Scientific and Technological Development, Brazil.

## Publications

- S. Scalzo, A. Marcelo, F.A.M. Marques, et al. **Dense optical flow software to quantify cellular contractility.** *Cell Reports Methods*, v. 1, p. 100044, 2021.
- A.F.G. Monte, G.A. Alves, F.A.M. Marques . **Thermal conductivity determination of erbium-doped crystals measured by spatially resolved confocal luminescence.** *Applied Optics*, v. 57, p. 7910, 2018.
- F.A.M. Marques, R. Angelini, G. Ruocco and B. Ruzicka. **Isotopic Effect on the Gel and Glass Formation of a Charged Colloidal Clay: Laponite.** *Journal of Physical Chemistry B*, v. 121, p. 4576-4582, 2017.
- F.A.M. Marques, R. Angelini, E. Zaccarelli, B. Farago, B. Ruta, G. Ruocco and B. Ruzicka. **Structural and microscopic relaxations in a colloidal glass.** *Soft Matter (Print)*, v. 11, p. 466-471, 2014.
- R. Angelini, E. Zaccarelli, F.A.M. Marques, M. Sztucki, A. Flueraşu, G. Ruocco and B. Ruzicka. **Glass–glass transition during aging of a colloidal clay.** *Nature Communications*, vol. 5 (2014), art. no. 4049, doi:10.1038/ncomms5049.
- L. Zulian, F.A.M. Marques, E. Emilietri, G. Ruocco and B. Ruzicka. **Dual aging behaviour in a clay-polymer dispersion.** *Soft Matter*, vol. 10 (2014), pp. 4513-4521, doi:10.1039/c4sm00172a.

- F.A.M. Marques and A.F.G. Monte. **Two-dimensional energy transfer between self-assembled quantum dots modulated by an external electric field.** *Journal of Applied Physics*, vol. 113 (2013), art. no. 113702, doi:10.1063/1.4795342.
- F.A.M. Marques, A.F.G. Monte, E.O. Serqueira, P.C. Morais and N.O. Dantas. **Enhanced spatial energy transfer in Er-doped silica glasses.** *Optical Materials*, vol. 32, (2010), pp. 1248-1250, doi:10.1016/j.optmat.2010.04.028.
- F.A.M. Marques, A.F.G. Monte and M. Hopkinson. **Electric field effects on the carrier migration in self-assembled InAs/GaAs quantum dots.** *Microelectronics Journal*, vol. 40, (2009), pp. 838-840, doi:10.1016/j.mejo.2008.11.025.

## Research Fields and Interests (briefly)

Optical and spectroscopic properties of condensed matter. Synthesis and characterization of semiconductor quantum dots (QDs). Dynamic and structural properties of soft matter. Instrumentation applied in optics, mechanics, and electronics.

## Research Projects

- **(2022 - Present)** *Silicate, Borate and Phosphate Glasses Doped with Quantum Dots.* Quantum dots are semiconductor crystals with dimensions on the order of tens of nanometers. Because they possess quantum confinement properties of charge carriers, quantum dots have attracted great attention in the scientific world for research with applications in various areas such as the construction of transistors, photovoltaic cells, LEDs, lasers, displays, biological systems, among many others. The search for a low-cost and easy-to-produce host matrix that has optical and electrical properties that suit the characteristics of the application is extremely important to enable the preparation of a final product. Thus, the main objective of this work is to seek growth mechanisms for Cadmium Selenide (CdSe), Cadmium Sulfide (CdS), and Cadmium Telluride (CdTe) quantum dots in glassy matrices of silicates, borates, and phosphates. The samples will be characterized by various optical spectroscopy techniques, Nuclear Magnetic Resonance (NMR), X-Ray Diffraction, XPS, and microscopy images for analysis of possible applications, as well as physical property characterization using Archimedes' density method, thermal analysis by DSC, and impedance spectroscopy. With the concatenated use of these various techniques, we hope to obtain a complete overview of nanocrystal growth as well as the structure of the glassy matrix and thus advance in the knowledge and development of a methodology for growing quantum dots in glassy matrices of technological interest.

Funding agency: Minas Gerais Research Support Foundation (FAPEMIG)

- **(2019 - Present)** *Obtaining polyaniline/metal oxide films using the superficial polymerization technique.* This proposal deals with obtaining films of polyaniline/metal oxides using the technique of superficial polymerization (PSup), which is a low-cost method for obtaining thin films of polymers and composite materials. These films can be applied in electronic, optoelectronic, and sensor devices. This synthesis involves direct polymerization on substrates, forming extremely thin films. This proposal aims to study

and obtain PANI/metal oxide films with different dopants, such as titanium dioxide, tin dioxide, and zinc oxide, producing composite films with different applications. These films will be characterized by structural, morphological, electrical, and optical techniques and studied in specific applications.

- **(2018 - Present)** *Study of Dynamic and Structural Properties of Biological Systems and Foods*. Dynamic light scattering is a non-invasive technique widely used by the scientific community to investigate the dynamic and structural properties of various systems. This work aims to build a low-cost optical setup for dynamic light scattering to study biological systems and food quality.
- **(2016 - Present)** *Instrumentation in Optics, Mechanics, and Electronics*. Instrumentation is the science that applies and develops techniques and instruments for measuring, indicating, acquiring, and controlling signals. It is widely used in the creation of new devices that aid in the automation of instruments, and is therefore extremely important for scientific and technological development. This work aims to develop various low-cost optical, mechanical, and electronic instruments for both scientific applications and the improvement and creation of new devices.

## Computing Skills

Knowledge of Linux and Windows operating systems. Programming experience in Fortran, MatLab and Python (PyQt cross-platform for graphic user interfaces). In course of my research I have made use of the LabView.

## Participation in Conferences, Meetings, Schools, etc

- International Trainee Symposium in Agri-Food, Nutrition and Health from the Canadian Centre for Agri-Food Research in Health and Medicine (CCARM). Online, 2023.
- Open House. Oral presentation: *Experimental Physics with Emphasis on Optics and Applied Instrumentation*. Lavras, Brazil, 2022.
- V Week of Physics and Physics Engineering at UFLA: Physics generating technological innovation. 2021.
- Physics Colloquium. Oral presentation: *Quantum dots in biology and medicine*. Lavras, Brazil, 2019.
- Seminar of the Postgraduate Program in Physics at the Federal University of Lavras. Oral presentation: *Nanoparticles applied to biology and medicine*. Lavras, Brazil, 2019.
- III Symposium on Physics, Technology and Innovation. Lavras, Brazil, 2018.
- Pint of Science. Oral invited speaker: *Science and Technology Applied in Medicine*. Lavras, Brazil, 2018.
- First Week of Polymers at the Federal University of Lavras. Oral presentation: *Influence of Polystyrene Oxide on the Aging Property of Synthetic Laponite Clay*. Lavras, Brazil 2018.
- I Physics Week. Oral presentation: *Soft matter and its complex properties obtained through light scattering*. Lavras, Brazil, 2017.
- II Symposium on Physics, Technology and Innovation. Lavras, Brazil, 2016.

- I National Symposium on Nanobiotechnology (SNNB)/ II UFMG Nanobiotechnology Workshop. Belo Horizonte, Brazil, 2016.
- Italian Soft Days 2014 (First Edition). Rome, Italy, 2014. Oral presentation: “*Structural and Microscopic Relaxations in a Charged Colloidal Glass Under Aging*” and Poster presentation: “*Effect of Poly(Ethylene Oxide) in the Aging of Laponite Systems*”.
- 24<sup>th</sup> ESRF Users Meeting and Associated Workshops, ESRF - Grenoble, France, 2014. Invited speaker parallel sessions: “Structural and Microscopic Relaxations in a Charged Colloidal Glass Under Aging”.
- International Soft Matter Conference. Rome, Italy, 2013. Poster presentation: “*Effect of Poly(Ethylene Oxide) in the Aging of Laponite Systems*”.
- International School of Physics “Enrico Fermi”. Course CLXXXIV “Physics of Complex Colloids”. Varenna, Italy, 2012.
- 1<sup>st</sup> Institute for Chemical-Physical Processes General Meeting. National Research Council. Cetraro, Italy, 2012. Poster presentation: “*Effect of Poly(Ethylene Oxide) in the Aging of Laponite Systems*”.
- Workshop on Aggregation and Dynamic Arrest in Colloidal Systems. Università di Roma “La Sapienza”, Italy, 2011. Poster presentation: “*Aging Investigations in a Clay-Polymer System*”.
- XXXII Brazilian Meeting on Condensed Matter Physics. Brazilian Physical Society. Aguas de Lindoia - SP, Brazil, 2009. Poster presentation: “*Influence of external electric field on the carrier diffusion in InAs/GaAs quantum dots*”.
- 14<sup>th</sup> Brazilian Workshop on Semiconductor Physics. Curitiba - PR, Brazil, 2009. Poster Presentation: “*Determination of maximum carrier propagation in InAs/GaAs quantum dots with external applied bias*”.
- VI Regional meeting of Brazilian Physical Society. Ouro Preto - MG, Brazil, 2008. Poster Presentation: “*Influence of electric field on spatially resolved microluminescence of semiconductor quantum dots*”.
- 15th International Conference on Superlattices, Nanostructures and Nanodevices. Natal - RN, Brazil, 2008. Posters presentation: “*Nonlinear effects of the photocurrent in self-assembled InAs/GaAs quantum dots*” and “*Electric field effects on the carrier migration in self-assembled InAs/GaAs quantum dots*”.
- XXXI Brazilian Meeting on Condensed Matter Physics. Brazilian Physical Society. Aguas de Lindoia - SP, Brazil, 2008. Posters presentation: “*Spatially resolved microluminescence investigation in quantum dots*” and “*Anomalous photocurrent in a self-assembled quantum dots*”.
- Marie Curie Training Course: “Understanding Molecular Simulations” at Universiteit van Amsterdam. Amsterdam, Netherlands, 2007.
- XXIX Brazilian Meeting on Condensed Matter Physics. Brazilian Physical Society. São Lourenço - MG, Brazil, 2006. Posters presentation: “*Energy transfer study in  $Tm^{3+}$  and  $Er^{3+}$  doped glasses*”.
- Summer School organized by the Institute of Physics at University of São Paulo. São Paulo - SP, Brazil, 2006.

- III International Symposium on Non-Crystalline Solids and VII Brazilian Symposium on Glass and Related Materials Conference. Maringá - PR, Brazil, 2005. Oral presentation: “*Energy transfer mechanisms in oxide glass as a function of  $Er_2O_3$  concentration*” and Poster presentation: “*Energy transfer mechanisms between  $^1G_4$  and  $^3H_4$  levels as a function of  $Tm^{3+}$  concentration*”.
- II School organized by the Physics Institute of Fluminense Federal University. Niterói - RJ, Brazil, 2005.
- XXVIII Brazilian Meeting on Condensed Matter Physics. Brazilian Physical Society. Santos - SP, Brazil, 2005. Poster presentation: “*Optical absorption and photoluminescence of  $Er_2O_3$  doped glasses*”.
- XVI Brazilian Symposium on physics teaching. Rio de Janeiro - RJ Brazil, 2005.
- IX Brazilian School of Electronic Structure. Salvador - BA, Brazil, 2004. Poster presentation: “*Optical absorption spectroscopy of  $Nd^{3+}$  doped oxide glasses*”.
- I Academic week of the Federal University of Uberlândia. Uberlândia - MG, Brazil, 2004. Oral presentation: “*Optical properties study of rare earth doped glasses*”.
- XXVII Brazilian Meeting on Condensed Matter Physics. Brazilian Physical Society. Poços de Caldas - MG, Brazil, 2004.
- IX Jorge André Swieca Summer School on Quantum Optics and Non-linear Optics. Belo Horizonte - MG, Brazil, 2004.
- IV Regional meeting of Brazilian Physical Society. São João Del Rei - MG, Brazil, 2003. Course participation: “*Advanced techniques in microscopy*”.

## Languages

- Portuguese (native tongue)
- English (understand, read, write and speak)
- Italian (understand, read, write and speak)
- French (understand and read)
- Spanish (understand and read)

## Teaching Experience

- **(2016 - Present)** Teaching Physics laboratory courses for the basic cycle of engineering programs at the Federal University of Lavras. Physics Laboratory A, B and C.
- **(2016 - Present)** Teaching theoretical and practical courses for the advanced cycle of the Physics Engineering program at the Federal University of Lavras. Theoretical courses include Optics and Photonics, while practical courses include Instrumentation in Optics and Photonics.

Lavras, 27 April 2023



Flavio Augusto de Melo Marques