

# João Tiago Moniz Fernandes



## Profile

- Versatile scientist with 10+ years of research experience in the synthesis and functionalization of different kinds of nanomaterials (*e.g.* magnetic or plasmonic nanoparticles, dendrimers, other polymeric systems).
- Experience in several purification and characterisation methods specifically adapted to polymeric formulations.
- Proven ability to communicate in science based on published works and several conference presentations.
- Recognized creativity and flexibility to provide novel solutions and add value to the research projects.
- Interested in working in a friendly and inclusive environment that promotes the discussion of scientific findings and the development of social/professional skills.

## Position

Postdoc in Surface Chemistry research area - The BioRobotics Institute, Sant'Anna School of Advanced Studies

## Relevant Professional Experience

### Postdoc Research Fellow

Nanochemistry Research Group, International Iberian Nanotechnology Laboratory,  
Braga 4715-330, Portugal.

July 2022 – Sept 2024

- **European Research Project - SpinCat:** “Establish cost-effective hydrogen production via reducing the cost of membrane-based electrolyser technology by omitting the need for platinum-group metals” (<https://www.spincat.eu/team>).
- Synthesised and characterised several magnetic spinel nanoparticles, complex metal oxides and perovskites and implemented large-scale synthesis protocol of these systems (6 grams to 22 grams of material).
- Explored the performance of these materials under several operational conditions as catalysts for oxygen evolution reaction and the influence of an external magnetic gradient.

### PhD Research Grant

CICECO, Chemistry Department, University of Aveiro, 3810-193 Aveiro, Portugal

Sept 2017 – May 2022

- **Research project entitled:** “Magneto-plasmonic nanoassemblies using dendrimers: chemical synthesis and water quality monitoring”, supervised by Prof. Dr. Tito Trindade and co-supervised by Dr. Ana Luísa Daniel-da-Silva.
- Synthesised and characterised several magneto-plasmonic hybrid nanosorbents containing dendrimers exposed at the surface.
- Explored the performance of these materials under several operational conditions for the SERS monitoring of water samples spiked with pesticides of different chemical families.

### Master Research Fellowship

CICECO, Chemistry Department, University of Aveiro, 3810-193 Aveiro, Portugal

Jul 2016 – Sept 2017

- **Research project entitled:** “Magnetic nanomaterials for herbicide uptake from water”, supervised by Prof. Dr. Ana Luísa Daniel-da-Silva and co-supervised by Prof. Dr. Tito Trindade.
- Synthesised and characterised several magnetic hybrid nanosorbents containing biopolymers exposed at the surface;
- Explored the performance of these materials under several operational conditions for the remediation of water contaminated with herbicides.

### Invited Lecturer

Madeira Chemistry Research Centre (CQM), University of Madeira, 9000-390 Funchal, Portugal.

Oct 2015 – Apr 2016

- Invited lecturer for two Master's courses: Nanochemistry I and Analysis and Characterisation of Nanomaterials I.
- The students conducted several works related to the synthesis, characterisation and purification of nanomaterials. Some of these works included: a) the investigation of quantum effects and optical properties of inorganic nanocrystals; b) the synthesis of silver nanoprisms and the analysis of their catalytic activity.

**Master Research Fellowship****May 2015 – July 2015**

Madeira Chemistry Research Centre (CQM), University of Madeira, 9000-390 Funchal, Portugal.

- **Research project entitled:** “Clay catalysts for biomass conversion”, supervised by Prof. Dr. Paula Castilho.
- Studied the catalytic activity of clays for biomass conversion and explored several reaction parameters in order to optimize the conversion efficiency.
- Evaluated the conversion efficiency of other commercial catalysts under similar reactional conditions.
- Determined the catalytic efficiency by the separation and quantification of reaction products using chromatographic techniques.

**Master Thesis, Professional Traineeship Grant****Oct 2013 – Jan 2015**

Madeira Chemistry Research Centre (CQM), University of Madeira, 9000-390 Funchal, Portugal.

- **Research project entitled:** “Synthesis of FITC-PAMAM conjugates for *in vitro* cell studies”, supervised by Prof. Dr. João Rodrigues.
- Explored several methodologies for the end group functionalization of distinct PAMAM dendrimers with a fluorescent probe (stochastic conjugation through crosslinkers).
- Characterized the obtained compounds (10 in total) through several techniques, such as NMR, FTIR, Fluorescence or UV/Vis.
- Investigated the efficiency of several purification techniques in order to remove the unconjugated dye.
- Evaluated the cytotoxicity of the obtained compounds based on preliminary metabolic assays (*i.e.* resazurin).

**Traineeship****Oct 2011 – Jan 2012**

Biology Department, University of Madeira, 9000-390 Funchal, Portugal.

- **Project entitled:** “Population structure of the *Sinapidendron* sp. using ITS and trnL regions”, supervised by Prof. Dr. Manuela Gouveia.
- Evaluated the common genetic profile of several *Sinapidendron* sp. through the analysis of specific DNA regions (ITS and trnL). For this purpose, several DNA extraction, purification, quantification and amplification techniques were explored.

**Traineeship****Feb 2011 – June 2011**

Madeira Chemistry Research Centre (CQM), University of Madeira, 9000-390 Funchal, Portugal.

- **Project entitled:** “Nanoparticle analysis using Zetasizer and qNano”, supervised by Prof. Dr. Helena Tomás.
- Analysed the size and zeta potential of iron oxide nanoparticles through DLS and TRPS.
- Explored the impact of the dispersing medium and surface chemistry (such as ionic strength or polarity) over the size distribution of the nanoparticles.

**Traineeship****Jun 2010 – June 2010**

Madeira Chemistry Research Centre (CQM), University of Madeira, 9000-390 Funchal, Portugal.

- **Project entitled:** “Materials and techniques in Biomedicine”, supervised by Prof. Dr. Helena Tomás with duration of 160h.
- Earned basic competences about nanomaterials and characterization techniques that may be used in biomedicine (mainly metal and polymeric nanoparticles).
- Acquired new skills related with cell culture and cytotoxicity assays.

**Traineeship****Feb 2010 – May 2010**

Madeira Chemistry Research Centre (CQM), University of Madeira, 9000-390 Funchal, Portugal.

- **Project entitled:** “Preparation of microcapsules using the Layer-by-Layer technique / Synthesis of photoluminescent nanorings for gene delivery”, supervised by Prof. Dr. Helena Tomás.
- Investigated several coprecipitation techniques for the preparation of CaCO<sub>3</sub> microparticles capable of encapsulating pDNA.
- Explored the effect of different coprecipitation conditions (such as pH, concentration, stirring or addition rate) over the size of the CaCO<sub>3</sub> particles.
- Prepared nano/microcapsules through the deposition of synthetic linear polymers (PSS/PAH) around the CaCO<sub>3</sub> microparticles.
- Worked along with a PhD researcher for the preparation of photoluminescent nanorings based on biodegradable polymers.

## Education

### PhD in Nanosciences and Nanotechnologies with distinction

2022

University of Aveiro, Portugal

**Overall Classification (curricular part):** 18 out of 20. **ECTS Scale:** A.

### Master in Nanochemistry and Nanomaterials

2015

University of Madeira, Portugal

**Overall Classification:** 18 out of 20. **ECTS Scale:** A.

### Bachelor in Biochemistry

2011

University of Madeira, Portugal

**Overall Classification:** 16 out of 20. **ECTS Scale:** B.

## Awards

- Best Oral Presentation Award (Jury Selection), INL, Portugal (2023).
- Selected Cover Publication for Nanomaterials (2017) and Chemistry A European Journal (2023).
- PhD degree with distinction, University of Aveiro, Portugal (2022).
- Best Oral Presentation Award (Young Researcher), RICI7, Madrid, Spain (2017).
- Best Student Award, University of Madeira, Portugal (2016).

## Job Related Skills

- Hands-on experience related with the synthesis and surface modification of multifunctional soft or hard nanomaterials (*e.g.* magnetic and plasmonic nanoparticles, dendrimers, polymeric nanocapsules and biopolymers).
- Hands-on experience with several characterisation techniques that are routinely used to determine nanoparticle size, shape, chemical composition, crystalline structure, surface chemistry/charge and magnetic profile, such as:
  - Multinuclear NMR, MS, XRD, Raman, FTIR, UV/Vis, Spectrofluorimetry, TEM, SEM, EDS, DLS, EA, ICP, AA, SQUID, VSM, TRPS, BET and TGA.
- Experience with several nanoparticle surface modification and functionalization methods including polymer grafting, ligand exchange, crosslinking or bioconjugation.
- Hands-on experience in analytical operation of several chromatographic techniques including HPLC and GC-MS.
- Firsthand experience on the design of optical nanosensors for trace level detection of water contaminants through surface-enhanced Raman spectroscopy (SERS);
- Experience on the design of experimental procedures for the evaluation of the adsorption or photocatalytic efficiency of (nano)materials (*e.g.* isotherms, kinetic parameters and related modulation).
- Interested in participating in the knowledge transfer of scientific findings to the industry, as well as the scientific and non-scientific public.

## Selected Publications

- Tiago Fernandes, Ramsundar Mohan, Laura Donk, Wei Chen, Chiara Biz, Mauro Fianchini, Saeed Kamali, Anna Kitayev, Aviv Ashdot, Miles Page, Laura M. Salonen, Sebastian Kopp, Ervin Tal Gutelmache, José Gracia, Marta Costa Figueiredo, Yury V. Kolen'ko. Anion Exchange Membrane Water Electrolysis over Superparamagnetic Ferrites. **2024** Energy Advances (doi: 10.1039/D4YA00170B).
- D.Piva, G.Fang, S.Ghojavand, F.Dalena, N.AlHajjar, V.D.Waele, V.Ordonsky, A.Khodakov, K.B.Tayeb, T.Fernandes, S.Mintova. Role of hydroxyl groups in Zn-containing nanosized MFI zeolite for the photocatalytic oxidation of methane. **2024** ChemSusChem (doi: 10.1002/cssc.202401656).
- Seongyoung Kong, Prashant Singh, Georgiy Akopov, Dapeng Jing, Ryan Davis, Jorge Perez-Aguilar, Jiyun Hong, Shannon J. Lee, Gayatri Viswanathan, Ernesto Soto, Muhammad Azhan, Tiago Fernandes, Stasia Harycki, Alexander Gundlach-Graham, Yury V. Kolen'ko, Duane D. Johnson, Kirill Kovnir. Probing of the Non innocent Role of P in Transition-Metal Phosphide Hydrogen Evolution Reaction Electrocatalysts via Replacement with Electropositive Si. **2023** Chemistry of Materials, 35, 5300–5310.
- Tiago Fernandes, Helena I. S. Nogueira, Dr. Carlos O. Amorim, João S. Amaral, Ana L. Daniel-da-Silva, Tito Trindade. Chemical Strategies for Dendritic Magneto-plasmonic Nanostructures Applied to Surface-Enhanced Raman Spectroscopy. **2022** Chemistry A European Journal, 28, e202202382 (Cover Article).

- T. Fernandes, N.C.T. Martins, A.L. Daniel-da-Silva, T. Trindade. Dendrimer-based magneto-plasmonic nanosorbents for water quality monitoring using surface-enhanced Raman spectroscopy. **2022** Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy, 283, 121730.
- T. Fernandes, A.L. Daniel-da-Silva, T. Trindade. Metal-dendrimer hybrid nanomaterials for sensing applications. **2022** Coordination Chemistry Reviews, 460, 214483.
- T. Fernandes, N.C.T. Martins, S. Fateixa, H.I.S Nogueira, A.L. Daniel-da-Silva, T. Trindade. Dendrimer Stabilized Nanoalloys for Ink-Jet Printing of Surface-Enhanced Raman Scattering Substrates. **2022** Journal of Colloid and Interface Science, 612, 342-354.
- T. Fernandes, S. Fateixa, M. Ferro, H.I.S Nogueira, A.L. Daniel-da-Silva, T. Trindade. Colloidal dendritic nanostructures of gold and silver for SERS analysis of water pollutants. **2021** Journal of Molecular Liquids, 337, 116608.
- N.C.T. Martins, S. Fateixa, T. Fernandes, H.I.S Nogueira, T. Trindade. Inkjet Printing of Ag and Polystyrene Nanoparticle Emulsions for the One-Step Fabrication of Hydrophobic Paper-Based Surface-Enhanced Raman Scattering Substrates. **2021** ACS Applied Nano Materials, 4, 4484-4495.
- T. Fernandes, S. Fateixa, H.I.S Nogueira, A.L. Daniel-da-Silva, T. Trindade. Dendrimer-based gold nanostructures for SERS detection of pesticides in water. **2020** European Journal of Inorganic Chemistry, 13, 1153-1162.
- T. Fernandes, S.F. Soares, T. Trindade, A.L. Daniel-da-Silva. Recent advances on magnetic biosorbents and their applications for water treatment. **2020** Environmental Chemistry Letters, 18, 151-164.
- A. Beegam, M. Lopes, T. Fernandes, J. José, A. Barreto, M. Oliveira, A.M.V.M. Soares, T. Trindade, S. Thomas, M.L. Pereira. Multiorgan histopathological changes in the juvenile seabream Sparus aurata as a biomarker for zinc oxide particles toxicity **2020** Environmental Science and Pollution Research, 27, 30907–30917.
- T. Fernandes, S.F. Soares, A.L. Daniel-da-Silva, T. Trindade. The controlled synthesis of complex hollow nanostructures and prospective applications. **2019** Proceedings of the Royal Society A, 475, 20180677.
- S.F. Soares, T. Fernandes, M. Sacramento, T. Trindade, A.L. Daniel-da-Silva. Magnetic quaternary chitosan hybrid nanoparticles for the efficient uptake of diclofenac from water. **2019** Carbohydrate polymers, 203, 35-44.
- S.F. Soares, T. Fernandes, T. Trindade, A.L. Daniel-da-Silva. Trimethyl Chitosan/Siloxane-Hybrid Coated Fe<sub>3</sub>O<sub>4</sub> Nanoparticles for the Uptake of Sulfamethoxazole from Water. **2018** Molecules, 24, 1958.
- S.R.D. Gamelas, A.T.P.C. Gomes, N.M.M. Moura, M.A.F. Faustino, J.A.S. Cavaleiro, C. Lodeiro, M.I.S. Veríssimo, T. Fernandes, A.L. Daniel-da-Silva, M.T.S.R. Gomes, M.G.P.M.S. Neves. N-Confused porphyrin immobilized on solid supports: synthesis and metal ions sensing efficacy. **2018** Molecules, 23, 867.
- T. Fernandes, S.F. Soares, T. Trindade, A.L. Daniel-da-Silva. Surface engineered magnetic biosorbents for water treatment. In: G. Crini, and E. Lichtfouse, (editors) Green Adsorbents for Pollutant Removal. **2018**, pp. 301-342.
- T. Fernandes, S. F. Soares, T. Trindade, A. L. Daniel-da-Silva. Magnetic hybrid nanosorbents for the uptake of paraquat from water. Nanomaterials **2017**, 7, 68.
- T. Fernandes, H. Tomás, J. Rodrigues. Synthesis of FITC-PAMAM conjugates for *in vitro* cell studies. **2015**, Master's Thesis.
- J. L. Santos, A. Nouri, T. Fernandes, J. Rodrigues, H. Tomás. Gene Delivery Using Biodegradable Polyelectrolyte Microcapsules Prepared Through the Layer-by-Layer Technique. Biotechnology Progress **2012**, 4, 1088-1094.

### Selected recent presentations (Poster or Oral)

- Tiago Fernandes, Ramsundar Mohan, Laura Donk, Wei Chen, Chiara Biz, Mauro Fianchini, Saeed Kamali, Anna Kitayev, Aviv Ashdot, Miles Page, Laura M. Salonen, Sebastian Kopp, Ervin Tal Gutelmacher, José Gracia, Marta Costa Figueiredo, Yury V. Kolen'ko. INL Annual Research Symposium (Poster Presentation), Braga, April 22-24, 2024.
- Tiago Fernandes, Ramsundar Mohan, Laura Donk, Wei Chen, Chiara Biz, Mauro Fianchini, Saeed Kamali, Anna Kitayev, Aviv Ashdot, Miles Page, Laura M. Salonen, Sebastian Kopp, Ervin Tal Gutelmacher, José Gracia, Marta Costa Figueiredo, Yury V. Kolen'ko. Nanochemistry Day 2023 (Oral Presentation Award), Braga, December 7, 2023.
- Tiago Fernandes, Ramsundar Mohan, Laura Donk, Wei Chen, Chiara Biz, Mauro Fianchini, Saeed Kamali, Anna Kitayev, Aviv Ashdot, Miles Page, Laura M. Salonen, Sebastian Kopp, Ervin Tal Gutelmacher, José Gracia, Marta Costa Figueiredo, Yury V. Kolen'ko. SpinCat Workshop Catalysis (Poster Presentation), Eindhoven, November 13-14, 2023.
- Tiago Fernandes, Rani M. Ramsundar, Yury V. Kolen'ko. Magnetic field enhanced water splitting using spinel ferrite nanoparticles. INL Annual Research Symposium (Poster Presentation), Braga, April 19-21, 2023.
- T. Fernandes, N.C.T. Martins, S. Fateixa, H.I.S Nogueira, A.L. Daniel-da-Silva, T. Trindade. Dendrimer-based metal nanoalloys for optical detection of pesticides. 13<sup>th</sup> IBCC (Oral presentation), Aveiro, March 29-30, 2022.

- T. Fernandes, A.L. Daniel-da-Silva, T. Trindade. Magneto-plasmonic nanoassemblies using dendrimers: chemical synthesis and water quality monitoring. Research Summit 2021 (Oral presentation), Online Conference, July 7-9, 2021.
- T. Fernandes, N.C.T. Martins, S. Fateixa, H.I.S Nogueira, A.L. Daniel-da-Silva, T. Trindade. Design of dendrimer coated metal alloys with SERS sensing capability for pesticides. 10th International Colloids Conference (Poster presentation), Online Conference, December 7-10, 2020.
- T. Fernandes, A.L. Daniel-da-Silva, T. Trindade. Magneto-plasmonic nanoassemblies using dendrimers: chemical synthesis and water quality monitoring. Research Summit 2020 (Oral presentation), Aveiro, Portugal, June 24-26, 2020.
- T. Fernandes, A.L. Daniel-da-Silva, T. Trindade. Shape evolution of dendrimer-stabilized alloy nanoparticles and their respective SERS signal of dithiocarbamate pesticides. Symposium nanoLAB 2019 (Oral presentation), Aveiro, Portugal, November 28, 2019.
- T. Fernandes, S. Fateixa, H.I.S. Nogueira, A.L. Daniel-da-Silva, T. Trindade. Dendrimer-based plasmonic systems for the SERS detection of pesticides in water. VIII Iberian Meeting on Colloids and Interfaces RIC18 (Poster presentation), Aveiro, Portugal, July 17-19, 2019 (Also Member of the Organizing Committee).
- T. Fernandes, S. Fateixa, H.I.S. Nogueira, A.L. Daniel-da-Silva, T. Trindade. Dendrimer-based plasmonic systems for the SERS detection of pesticides in water. Jornadas do CICECO (Poster presentation), Aveiro, Portugal, July 17-19, 2019.
- T. Fernandes, A.L. Daniel-da-Silva, T. Trindade. Magneto-plasmonic nanoassemblies using dendrimers: chemical synthesis and water quality monitoring. Research Summit 2019 (Oral presentation), Aveiro, Portugal, June 03-05, 2019.
- T. Fernandes, S.F. Soares, T. Trindade, A.L. Daniel-da-Silva. Versatile magnetic biohybrid nanosorbents for the removal of herbicides from water. VII Iberian Meeting on Colloids and Interfaces RIC17 (Oral presentation), Madrid, Spain, July 4-7, 2017 (Oral Presentation Award).
- S.F. Soares, T. Fernandes, M. Sacramento, T. Trindade, A.L. Daniel-da-Silva. Magnetic quaternized chitosan hybrid nanoparticles: potential prospects for the uptake of pharmaceuticals from water. VII Iberian Meeting on Colloids and Interfaces RIC17 (Poster presentation), Madrid, Spain, July 4-7, 2017.
- T. Fernandes, S.F. Soares, T. Trindade, A.L. Daniel-da-Silva. Magnetic biohybrid nanosorbents with tunable surface chemistry for the removal of cationic and anionic herbicides from water. Materiais 2017 (Poster presentation), Aveiro, Portugal, April 9-12, 2017.
- A. Beegam, M. Lopes, T. Fernandes, J. José, A. Barreto, M. Oliveira, A.M.V.M. Soares, T. Trindade, S. Thomas, M.L. Pereira. Effects of ZnO-NPs on Histology of Gilthead Seabream, Sparus aurata. Materiais 2017 (Poster presentation), Aveiro, Portugal, April 9-12, 2017.
- Tiago Fernandes, Sofia F. Soares, Tito Trindade and Ana L. Daniel-da-Silva. Magnetic biohybrid nanosorbents with tunable surface chemistry for the removal of cationic and anionic herbicides from water. Materiais 2017 (Poster presentation), Aveiro, Portugal, 10<sup>th</sup>-12<sup>th</sup> April 2017.
- Tiago Fernandes, Sofia F. Soares, Tito Trindade and Ana L. Daniel-da-Silva. Magnetic hybrid nanosorbents for herbicide uptake from water. 11<sup>th</sup> Inorganic Chemistry Conference (Poster presentation), Sintra, Portugal, 7<sup>th</sup>-8<sup>th</sup> October 2016.

## Languages

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**Mother tongue:** Portuguese.

**Other languages:**

**English:** Fluent in reading, writing and speaking. Proven based on scientific publications and oral communications.

**German:** Basic in reading, writing and speaking. Knowledge acquired by frequenting a course in German.