

Résumé

Name António Osmaro Santos Silva Rangel

Date of birth: October 22, 1962

Position: Professor Associado com Agregação

Institution: Universidade Católica Portuguesa, Escola Superior de Biotecnologia, Porto, Portugal

Academic Degrees/Titles

“Agregação” (Habilitation), Escola Superior de Biotecnologia, Universidade Católica Portuguesa, Porto, Portugal, July 2014

Doctor in Biotechnology (specialisation in Chemistry), Escola Superior de Biotecnologia, Universidade Católica Portuguesa, Porto, Portugal, September 1991

Degree (Licenciatura) in Chemistry, Faculdade de Ciências, Universidade do Porto, Portugal, October 1985

Present positions in the University management

President of the Scientific Board of the School

Associate Director of the Presidency of Universidade Católica Portuguesa - Porto

Other relevant present positions

Member of the Editorial Advisory Board of “Talanta”

Teaching experience

30 years as university teacher

Responsible for teaching the present courses (Licenciatura and Mestrado)

General Chemistry I (6 ECTS)

General Chemistry II (6 ECTS)

Analytical Chemistry (6 ECTS)

Instrumental Methods of Analysis (6 ECTS)

Instrumental Analysis and Laboratory Automation (5 ECTS)

Research interests

Studies are focused on recently proposed flow methods based on the concepts of sequential injection analysis, multi-commuted flow injection analysis, and Lab-on-Valve. These techniques provide in-line automation of chemical and enzymatic reactions (enzymes in solution or immobilised), separation processes (gas-diffusion, dialysis, ion-exchange) and pre-treatment processes (mineralization/extraction assisted by micro-wave and ultra-sounds). The objective is to miniaturise the systems/sensors and minimise consumption of reagents and effluents production. Applications to environmental and food analysis are envisaged.

Supervising experience

18 concluded PhD thesis (as supervisor or co-supervisor*):

Inês Carvalho dos Santos 2012-2015	<i>Contributions to techniques and mass spectrometry in water analysis</i>
Helena Maria Gomes Moreira* 2011 - 2014	<i>Role of Plants and Microorganisms in the Management of Heavy-Metal Polluted Areas as an Approach for Land Restoration</i>
Susana Maria Socorro Matos Peixoto Vidigal 2006-2011	<i>Development of Sequential Injection Enzymatic and Bead Injection Assays in a Lab-on-valve Format</i>
Ricardo Nuno Mendes de Jorge Páscoa 2007 – 2011	<i>Exploiting the Use of a Liquid Waveguide Capillary Cell for Spectrophotometric Determinations in Flow-Based Systems</i>
Liliana Sara Melo de Oliveira 2006 – 2010	<i>Development of Multicommuted Flow Systems with In-line Separation Processes for Water and Wine Analysis</i>
Karina Beatriz Hueso Domínguez** 2010	<i>Determinaciones Cinéticas de Acetona, 3-Hidroxibutirato/3-Hidroxivalerato y Glicerol en Sistemas de Flujo</i> <i>Doutoramento em Química, Faculdade de Ciências Químicas, Universidade de Salamanca, Espanha</i>
Maria Cristina Sousa Coutinho de Calheiros Menezes* 2001 - 2009	<i>Determinaciones Cinéticas de Acetona, 3-Hidroxibutirato/3-Hidroxivalerato y Glicerol en Sistemas de Flujo</i>

Maria Inês Gameiro de Sá Almeida 2002 - 2009	<i>Contributions to Automatic In-Line Sample Treatment for the Determination of Phosphorus and Potassium in Environmental Samples Based on Multi-Syringe Flow Injection Analysis</i>
Raquel Beatriz Ribeiro de Mesquita 2001 - 2007	<i>Development of Sequential Injection Methodologies for Monitoring Chemical Parameters in Waters</i>
Ana Paula Marques* 2002 - 2007	<i>The Potential of Plants Indigenous to Esteiro de Estarreja for Heavy Metal Phytoremediation Purposes</i>
Maria João Reis Lima 2000 – 2005	<i>Automatic Systems Based on Flow and Sequential Injection for Dairy Products Analysis</i>
Inês Patrícia Alves Morais 2000 - 2005	<i>Development of Spectrophotometric Flow Analysis Methods for Water Monitoring</i>
Marcela Alves Segundo 1997 - 2002	<i>Sequential Injection and Multi-Syringe Flow Systems for Wine Analysis</i>
Ildikó Vargané Tóth 1995 - 2001	<i>Flow Injection Multidetermination Systems for Wine Analysis</i>
Sílvia Maria Viegas Fernandes 1993 - 2001	<i>Development of Flow Injection Systems for Beer Analysis</i>
Maria Renata Soares Souto 1993 - 98	<i>Automatic Flow Injection Systems for the Analysis of Vegetables</i>
Teresa Isabel Marques da Silva Lopes 1992 - 98	<i>Flow Injection Systems for Wine Analysis</i>
Alexandra Marília Rodrigues Ferreira 1992 - 96	<i>Flow Injection Systems for Soil Analysis</i>

Research coordinator/co-coordinator of 13 R&D externally-funded national projects, 1 European project

Co-author of 6 international book chapters

Total number of papers co-authored in international journals with peer-review: 167

Publications in peer-reviewed journals (2010 – 2016)

I. C. Santos, R. B. R. Mesquita, C. L. Amorim, P. M. L. Castro, A. O. S. S. Rangel, Development of a low pressure chromatographic flow system for monitoring the biodegradation of ofloxacin and ciprofloxacin, *Anal. Methods*, **8**, 5427 – 5465 (2016). DOI: 10.1039/c6ay00476h

R. B. R. Mesquita, A. Machado, I. C. Santos, A. A. Bordalo, A. O. S. S. Rangel, Seasonal monitoring of inland bathing waters using a sequential injection method as a fast and effective tool for nutrient quantification (N : P), *Anal. Methods*, **8**, 1973-1980 (2016). DOI: 10.1039/C5AY02293B

H. Moreira, S. I. A. Pereira, A. P. G. C. Marques, A. O. S. S. Rangel, P. M. L. Castro, Mine land valorization through energy maize production enhanced by the application of plant growth-promoting rhizobacteria and arbuscular mycorrhizal fungi, *Environ. Sci. Pollut. Res.*, **23**, 6940–6950, (2016). <http://dx.doi.org/10.1007/s11356-015-5914-4>

J. R. Santos, O. Viegas, R. N. M. J. Páscoa, I. M. P. L. V. O. Ferreira, A. O. S. S. Rangel, J. A. Lopes, In-line monitoring of the coffee roasting process with near infrared spectroscopy: Measurement of sucrose and colour, *Food Chemistry*, **208**, 103–110, (2016). <http://dx.doi.org/10.1016/j.foodchem.2016.03.114>

J. R. Santos, M. Lopo, A. O. S. S. Rangel, J. A. Lopes, Exploiting near infrared spectroscopy as an analytical tool for on-line monitoring of acidity during coffee roasting, *Food Control*, **60**, 408-415, (2016). <http://dx.doi.org/10.1016/j.foodcont.2015.08.007>

J. L. A. Miranda, R. B. R. Mesquita, A. Nunes, M. Rangel, A. O. S. S. Rangel, Iron speciation in natural waters by sequential injection analysis with a hexadentate 3-hydroxy-4-pyridinone chelator as chromogenic agent, *Talanta*, **48**, 633-640, (2016). <http://dx.doi.org/10.1016/j.talanta.2015.05.062>

I. C. Santos, R. B. R. Mesquita, A. O. S. S. Rangel, The State of the Art of Flow-Through Solid-Phase Spectrometry, *LCGC*, **33** (10) (2015). <http://www.chromatographyonline.com/state-art-flow-through-solid-phase-spectrometry>

- I. C. Santos, R. B. R. Mesquita, A. O.S.S. Rangel, Micro solid phase spectrophotometry in a sequential injection lab-on-valve platform for cadmium, zinc, and copper determination in freshwaters, *Anal. Chim. Acta*, **891**, 171-178 (2015). <http://dx.doi.org/10.1016/j.aca.2015.08.021>
- I. C. Santos, Hongyue Guo, R. B. R. Mesquita, A. O. S. S. Rangel, D. W. Armstrong, K. A. Schug, Paired-ion electrospray ionization – triple quadrupole tandem mass spectrometry for quantification of anionic surfactants in waters, *Talanta*, **143**, 320–327, (2015). <http://dx.doi.org/10.1016/j.talanta.2015.04.081>
- R. B. R. Mesquita, T. Moniz, J. L. A. Miranda, V. Gomes, A. M. N. Silva, J. E. Rodriguez-Borges, A. O. S. S. Rangel, M. Rangel, *Polyhedron*, **101**, 171-178 (2015). <http://dx.doi.org/10.1016/j.poly.2015.09.015>
- A. C. Galvis-Sánchez, J. R. Santos, A. S. S. Rangel, Standard addition flow method for potentiometric measurements at low concentration levels: Application to the determination of fluoride in food samples, *Talanta*, **133**, 1–6 (2015). <http://dx.doi.org/10.1016/j.talanta.2013.12.058>
- C. S. C. Calheiros, V. S. Bessa, R. B. R. Mesquita, H. Brix, A. O. S. S. Rangel, P. M. L. Castro, Constructed wetland with a polyculture of ornamental plants for wastewater treatment at a rural tourism facility, *Ecol. Eng.*, **79**, 1–7 (2015). <http://dx.doi.org/10.1016/j.ecoleng.2015.03.001>
- I. C. Santos, V. B. Waybright, H. Fan, S. Ramirez, R. B. R. Mesquita, A. O. S. S. Rangel, P. Fryčák, K. A. Schug, Determination of Noncovalent Binding Using a Continuous Stirred Tank Reactor as a Flow Injection Device Coupled to Electrospray Ionization Mass Spectrometry, *J. Am. Soc. Mass Spectrom.*, **26**, 1204-1212 (2015). <http://dx.doi.org/10.1007/s13361-015-1113-2>
- 154** - I. C. Santos, R. B. R. Mesquita, A. O. S. S. Rangel, Screening of cadmium and lead in potentially contaminated waters using a spectrophotometric sequential injection lab-on-valve methodology, *Talanta*, **143**, 359–365 (2015). <http://dx.doi.org/10.1016/j.talanta.2015.05.005>
- I. C. Santos, R. B. R. Mesquita, A. A. Bordalo, A. O. S. S. Rangel, Iodine speciation in coastal and in land bathing waters and seaweeds extracts using a sequential injection standard addition flow-batch method, *Talanta*, **133**, 7–14 (2015). <http://dx.doi.org/10.1016/j.talanta.2014.01.025>
- I. S. Moreira, C. L. Amorim, A. R. Ribeiro, R. B.R. Mesquita, A. O. S. S. Rangel, M. C. M. van Loosdrecht, M. E. Tiritan, P. M. L. Castro, Removal of fluoxetine and its effects in the performance of an aerobic granular sludge sequential batch reactor, *J. Hazard. Mater.*, **287**, 93–101 (2015). <http://dx.doi.org/10.1016/j.jhazmat.2015.01.020>
- J. R. Santos, A. O. S. S. Rangel, Development of a chromatographic low pressure flow injection system using amperometric detection: Application to the analysis of niacin in coffee, *Food Chemistry*, **187**, 152–158 (2015). <http://dx.doi.org/10.1016/j.foodchem.2015.04.093>

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- S. S. M. P. Vidigal, A. O. S. S. Rangel, A flow injection system coupled to a micro-guard cartridge for monitoring a vinification process, *Anal. Sci.*, **30**, 1057-1062 (2014). <http://dx.doi.org/10.2116/analsci.30.1057>.
- S. S. M. P. Vidigal, A. O. S. S. Rangel, A flow injection system coupled to a micro-guard cartridge for monitoring a vinification process, *Anal. Sci.*, **30**, 1057-1062 (2014). <http://dx.doi.org/10.2116/analsci.30.1057>.
- H. Moreira, A. P. G. C. Marques, A. R. Franco, A. O. S. S. Rangel, P. M. L. Castro, Phytomanagement of Cd-contaminated soils using maize (*Zea mays* L.) assisted by plant growth-promoting rhizobacteria, *Environ Sci Pollut Res*, **21**, 9742–9753 (2014). doi 10.1007/s11356-014-2848-1.
- C. L. Amorim, A. S. Maia, R. B. R. Mesquita; A. O. S. S. Rangel, M. C. M. van Loosdrecht, M. E. Tiritan, P. M. L. Castro, Performance of aerobic granular sludge in a sequencing batch bioreactor exposed to ofloxacin, norfloxacin and ciprofloxacin, *Water Res.*, **50**, 101 – 113 (2014). doi 10.1016/j.watres.2013.10.043.
- C. S. C. Calheiros, A. O. S. S. Rangel, P. M. L. Castro, Constructed wetlands for tannery wastewater treatment in Portugal: ten years of experience. *Int. J. Phytoremediat.*, **16**, 859-870 (2014). doi: 10.1080/15226514.2013.798622.
- A. P. G. C. Marques, A. F. Duque, V. S. Bessa, R. B. R. Mesquita, A. O. S. S. Rangel, P. M. L. Castro, Performance of an Aerobic Granular Sequencing Batch Reactor Fed with Wastewaters Contaminated with Zn²⁺, *J. Environ. Manag.*, **128**, 877 – 882 (2013). doi: 10.1016/j.jenvman.2013.06.052.
- I. V. Tóth, I. C. Santos, C. F. M. Azevedo, J. F. S. Fernandes, R. N. M. J. Páscoa, R. B. R. Mesquita, A. O. S. S. Rangel, Flow-Injection Spectrophotometric Determination of Bromate in Bottled Drinking Water Samples Using Chlorpromazine Reagent and a Liquid Waveguide Capillary Cell, *Anal. Sci.*, **29**, 563-570 (2013).
- M. C. Sarraguça, J. R. Santos, A. O. S. S. Rangel, J. A. Lopes, Authenticity Control of Roasted Coffee Brands Using Near-Infrared Spectroscopy, *Food Anal. Methods*, **6**, 892-899 (2013). doi: 10.1007/s12161-012-9499-y.
- A. P. G. C. Marques, H. Moreira, A. R. Franco, A. O. S. S. Rangel, P. M. L. Castro, Inoculating *Helianthus annuus* (sunflower) Grown on Zinc and Cadmium Contaminated Soils with Plant Growth Promoting Bacteria- Effects on Phytoremediation Strategies, *Chemosphere*, **92**, 74-83 (2013). doi: 10.1016/j.chemosphere.2013.02.055.
- I. C. Santos, R. B.R. Mesquita, A. Machado, A. A. Bordalo, A. O. S. S. Rangel, Sequential Injection Methodology for Carbon Speciation in Bathing Waters, *Anal. Chim. Acta*, **778**, 38-47 (2013). doi: 10.1016/j.aca.2013.03.043.

R. B. R. Mesquita, R. Suárez, V. Cerdà, M. Rangel, A. O. S. S. Rangel, Exploiting the use of 3,4-HPO Ligands as Nontoxic Reagents for the Determination of Iron in Natural Waters with a Sequential Injection Approach, *Talanta*, **108**, 38-45 (2013). doi: 10.1016/j.talanta.2013.02.058.

A. C. Galvis-Sánchez, I. C. Santos, R. B.R. Mesquita, J. A. Lopes, A. O. S. S. Rangel, I. Delgadillo, Application of Mid- and Near-Infrared Spectroscopy for the Control and Chemical Evaluation of Brine Solutions and Traditional Sea Salts, *Food Anal. Methods*, **6**, 470-780 (2013). doi: 10.1007/s12161-012-9458-7.

T. F. M. Pais, S. S. M. P. Vidigal, I. V. Tóth, A. O. S. S. Rangel, Sequential Injection System for the Enzymatic Determination of Ethanol in Alcoholic Beverages with In-line Dilution, *Food Control*, **30**, 616-620 (2013). doi: 10.1016/j.foodcont.2012.08.013.

S. S. M. P. Vidigal, I. V. Tóth, A. O. S. S. Rangel, Sequential Injection Lab-on-valve Platform as a Miniaturisation Tool for Solid Phase Extraction, *Anal. Methods*, **5**, 585-597 (2013). DOI: 10.1039/c2ay26322j.

J. R. Santos, M. C. Sarraguça, A. O. S. S. Rangel, J. A. Lopes, Evaluation of Green Coffee Beans Quality using Near Infrared Spectroscopy: A Quantitative Approach, *Food Chem.*, **135**, 1828–1835 (2012). doi: 10.1016/j.foodchem.2012.06.059.

I. C. Santos, R. B.R. Mesquita, A. A. Bordalo, A. O. S. S. Rangel, Use of Solid Phase Extraction for the Sequential Injection Determination of Alkaline Phosphatase Activity in Dynamic Water Systems, *Talanta*, **98**, 203-210 (2012). doi: 10.1016/j.talanta.2012.06.071.

R. N. M. J. Páscoa, I. V. Tóth, A. O. S. S. Rangel, Review on Recent Applications of the Liquid Waveguide Capillary Cell in Flow Based Analysis Techniques to Enhance the Sensitivity of Spectroscopic Detection Methods, *Anal. Chim. Acta*, **739**, 1-13 (2012). doi: 10.1016/j.aca.2012.05.058.

S. S. M. P. Vidigal, I. V. Tóth, A. O. S. S. Rangel, Determination of Total Protein Content in White Wines by Solid Phase Spectrometry in a SI-LOV System, *Talanta*, **96**, 102-106 (2012). doi: 10.1016/j.talanta.2011.12.028.

I. C. Santos, R. B. R. Mesquita, A. C. Galvis-Sánchez, I. Delgadillo, A. O. S. S. Rangel, Development of a Turbidimetric Sequential Injection System to Monitor the Codfish Desalting Process, *Food Anal. Methods*, **5**, 287-295 (2012). doi: 10.1007/s12161-011-9238-9.

R. B. R. Mesquita, I. C. Santos, A. A. Bordalo, A. O. S. S. Rangel, Sequential Injection System Exploring the Standard Addition Method for Phosphate Determination in High Salinity Samples: Interstitial, Transitional and Coastal Waters, *Anal. Methods*, **4**, 1452-1457 (2012). doi: 10.1039/c2ay05792a.

J. R. Santos, A. O. S. S. Rangel, Development of a Chromatographic Low Pressure Flow Injection System: Application to the Analysis of Methylxanthines in Coffee, *Anal. Chim. Acta*, **715**, 57-63 (2012). doi: 10.1016/j.aca.2011.12.002.

- S. M. Oliveira, H. M. Oliveira, M. A. Segundo, A. O. S. S. Rangel, J. L. F. C. Lima, V. Cerdà, Automated Solid-Phase Spectrophotometric System for Optosensing of Bromated in Drinking Waters, *Anal. Methods*, **4**, 1229-1236 (2012). doi: 10.1039/c2ay05860j.
- H. Moreira, A. P. G. C. Marques, A. O. S. S. Rangel, P. M. L. Castro, Heavy Metal Accumulation in Plant Species Indigenous to a Contaminated Portuguese Site: Prospects for Phytoremediation, *Water Air Soil Pollut*, **221**, 377-389 (2011). doi: 10.1007/s11270-011-0797-6.
- R. L. A. Segundo, R. B. R. Mesquita, M. T. S. O. B. Ferreira, C. F. C. P. Teixeira, A. A. Bordalo, A. O. S. S. Rangel, Development of a Sequential Injection Gas Diffusion System for the Determination of Ammonium in Transitional and Coastal Waters, *Anal. Methods*, **3**, 2049-2055 (2011). doi: 10.10397/clay05129f.
- R. B. R. Mesquita, M. T. S. O. B. Ferreira, I. V. Tóth, A. A. Bordalo, I. D. McKelvie, A. O. S. S. Rangel, Development of a Flow Method for the Determination of Phosphate in Estuarine and Fresh Waters – Comparison of Flow Cells in Spectrophotometric Sequential Injection Analysis, *Anal. Chim. Acta*, **701**, 15-22 (2011). doi: 10.1007/s12161-011-9238-9.
- A. C. Galvis-Sánchez, J. A. Lopes, I. Delgadillo, A. O. S. S. Rangel, Fourier Transform Near-Infrared Spectroscopy Application for Sea Salt Quality Evaluation, *J. Agric Food Chem.*, **59**, 11109-11116 (2011). doi: 10.1021/jf202204d.
- R. J. Páscoa, I.V. Tóth, A. O. S. S. Rangel, Spectrophotometric Sensor System Based on a Liquid Waveguide Capillary Cell for the Determination of Titanium: Application to Natural Waters, Sunscreens and a Lake Sediment, *Sens. Actuators*, **157**, 51-56 (2011). doi: 10.1016/j.snb.2011.03.025.
- S. M. Oliveira, M. A. Segundo, A. O. S. S. Rangel, J. L. F. C. Lima, V. Cerdà, Spectrophotometric Determination of Bromate in Water Using Multisyringe Flow Injection Analysis, *Anal. Lett*, **44**, 284-297 (2011). doi: 10.1080/00032719.2010.500771.
- S. S. M. P. Vidigal, I. V. Tóth, A. O. S. S. Rangel, Exploiting the Bead Injection LOV Approach to Carry out Spectrophotometric Assays in Wine: Application to the Determination of Iron, *Talanta*, **84**, 1298-1303 (2011). doi: 10.1016/j.talanta.2011.01.041.
- R. B. R. Mesquita, I. C. Santos, M. F. F. Pedrosa, A. F. Duque, P. M. L. Castro, A. O. S. S. Rangel, Development of Flow Injection Potentiometric Methods for the Off-line and On-line Determination of Fluoride to Monitor the Biodegradation of a Monofluorophenol in Two Bioreactors, *Talanta*, **84**, 1291-1297 (2011). doi: 10.1016/j.talanta.2011.01.028.
- R. J. Páscoa, I.V. Tóth, A. O. S. S. Rangel, Spectrophotometric Determination of Zinc and Copper in a Multi-syringe Flow Injection Analysis System Using a Liquid Waveguide Capillary Cell: Application to Natural Waters, *Talanta*, **84**, 1267-1272 (2011). doi: 10.1016/j.talanta.2011.01.023.

A. C. Galvis-Sánchez, I. V. Tóth, A. Portela, I. Delgadillo, A. O. S. S. Rangel, Monitoring Sodium Chloride During Cod Fish Desalting Process by Flow Injection Spectrometry and Infrared Spectroscopy, *Food Control*, **22**, 277-282 (2011). doi: 10.1016/j.foodcont.2010.07.022.

S. M. Oliveira, T. I. M. S. Lopes, I. V. Tóth, A. O. S. S. Rangel, Simultaneous Determination of Tartaric Acid and Potassium in Wines Using a Multicommuted Flow System with Dialysis, *Talanta*, **81**, 1735–1741 (2010). doi: 10.1016/j.talanta.2010.03.032.

A. P. G. C. Marques, C. Pires, H. Moreira A. O. S. S. Rangel, P. M. L. Castro, Assessment of the Plant Growth Promotion Abilities of Six Bacterial Isolates Using *Zea mays* as Indicator Plant, *Soil Biol. Biochem.*, **42**, 1229 - 1235 (2010). doi: 10.1016/j.soilbio.2010.04.014.

S. S. M. P. Vidigal, I. V. Tóth, A. O. S. S. Rangel, Sequential Injection Lab-on-Valve System for the Determination of the Activity of Peroxidase in Vegetables, *J. Agric. Food Chem.*, **58**, 2071-2075 (2010). doi: 10.1021/jf9035113.

K. B. H. Domínguez, I. V. Tóth, M. R. S. Souto, F. Mendes, C. G. María, I. Vasconcelos, A. O. S. S. Rangel, Sequential Injection Kinetic Flow Assay for Monitoring Glycerol in a Sugar Fermentation Process by *Saccharomyces cerevisiae*, *Appl. Biochem. Biotech.*, **160**, 1664 – 1673 (2010). doi: 10.1007/s12010-009-8675-z.