

Professor Ana Aguiar-Ricardo

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Ana Aguiar-Ricardo is Professor of Chemical & Biochemical Engineering with expertise in the field of green chemistry and supercritical fluid technology targeting (bio)polymer synthesis, processing, and functionalization design. Her primary research focus is the development of greener chemical processing platforms for non-invasive drug delivery via dermal and pulmonary routes, and for (bio)separation processes. She graduated in Chemical Engineering from Instituto Superior Técnico (IST) and obtained a PhD from Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa (FCT-UNL, 1994) under the supervision of Prof. M. Nunes da Ponte. She did post-doctoral work at University of Nottingham, UK (1995), in the laboratory of Prof M. Poliakoff. She held a visiting position at Massachusetts Institute of Technology, Hammond lab (MIT, USA, July-December 2007). She is a member of the Advisory Board of Faculty of Sciences and Technology at NOVA University of Lisbon (FCT-NOVA), member of the scientific board of the LAQV-REQUIMTE, FCT-NOVA, where she leads the Green Polymer Synthesis & Processing Lab (GPS&P-Lab), a Faculty member of the MIT-Portugal joint PhD Program in Advanced Studies in Bioengineering and of the Doctoral program in Sustainable Chemistry and also of the scientific board. She was appointed National representative of Portuguese Chemical Society at IUPAC – Chemistry and the Environment Division during the term 2013-2016 and at Division on Green and Sustainable Chemistry of EuCheMS since 2015. She has co-authored over ninety-five papers in peer review journals (h-index: 21), six book chapters, over fifty articles in conference proceedings with transfer of copyright and three articles in national magazines with peer review. Registration of one national patent. She supervised 13 PhD thesis and 15 Master thesis. She was awarded twice by Hovione Prize – Solvay & Hovione Innovation Challenge (SHIC'2008 and 2011).

Academic Position

Full Professor, Department of Chemistry, Faculty of Science and Technology, New University of Lisbon. Scientific coordinator of Laboratory of Synthesis and Processing of Polymers and Biomaterials Using Supercritical Fluid Technology, LAQV-REQUIMTE.

Academic Degrees

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| 2011 | Habilitation in Sustainable Chemistry-Chemical & Biochemical Engineering |
| 1994 | Doctor of Philosophy in Chemistry, Physical Chemistry, Universidade NOVA de Lisboa. Advisor: Manuel Nunes da Ponte. PhD thesis: "Interaction second virial coefficients of mixtures of simple gases". Rating: Very Good with Distinction and Commendation unanimously. |

Present Research Interests

Domain of specialization: Sustainable chemistry - Chemical and Biochemical Engineering. Supercritical fluid technology.

Current research interests: Polymer synthesis and processing using sustainable technologies; Hydrogels and stimuli-responsive materials; Particle engineering for controlled drug delivery; Membrane and monoliths production using a CO₂ – assisted phase inversion method; Plasma surface activation and functionalization; Nanotechnology.

Prizes and Awards

Prémio Hovione – Solvay Hovione Ideas Challenge 2011: "Molecularly Imprinted Devices for Purification of APIs".

Luso-German Award, Action Nº A-13/10, 2010-11"Smart particle systems for controlled drug delivery".

Prémio Hovione – SHIC' 2008: "Smart Porous Particles: a new route for controlled release to the lungs".

Luso-American Development Foundation Award, 2007 – Visiting Professor at the Department of Chemical Engineering of the Massachusetts Institute of Technology.

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Luso – British Awards: Action Nº B-24/2001, 2001-02, Phase-behaviour in Supercritical CO₂. New strategies towards emulsions and polymerisation; Action Nº B-39/1998, 1998-99, "Supercritical Fluids – Clean Solvents for Polymer Synthesis and Materials Processing". Luso – British Award J.N.I.C.T. - British Council 423/RU, 1995-96 "Supercritical Fluids: Clean Solvents for Clean Chemistry". Luso – Spanish Award, Action Nº E-42/1997, 1997-98 "Organometallic Chemistry in Supercritical Fluids".

INIC – Fellow (Introduction to Research), developing research work in the field of photochemistry under the guidance of Prof. Dr. Silvia Brito Costa, Center for Structural Chemistry of IST.

Professional Societies

Member of the International Society for Advancement of Supercritical Fluids (ISASF), the American Chemical Society (ACS), the Royal Society of Chemistry (RSC) and the Portuguese Chemical Society (SPQ).

Professional Services

Member of the Supervisory Board of Faculdade de Ciências e Tecnologia (2013-2017).

National representative at IUPAC – Chemistry and the Environment Division (2013-2016).

Representative of Sociedade Portuguesa de Química in the EuCheMS WP on Green and Sustainable Chemistry (since Jan 2013).

Advisor of 13 PhD theses (three were recipients of ISASF Best Thesis Award (2008, 2010 and 2016)). Advisor of 15 Master theses (15). Participation in Doctoral examinations (22; as External Examiner (8)). 2 PhD projects in course (1 in Erasmus Mundus Doctoral Programme-Membranes and 1 "Doutorado Sanduiche" with FAPES).

Principal investigator of six research projects and team member of other 12 projects.

Evaluator of research projects (Luso-German, Luso-Brazilian) since 2002; External evaluator of research projects of Université de Liège in 2009 (Actions de Recherche Concerté 2009); Evaluator of projects of QREN SI I&DT programme (National Strategic Reference Framework - NSRF/QREN); Evaluator of projects H2020.

Chair of 2nd EuCheMS Congress on Green and Sustainable Chemistry, October 4-7, 2015, Lisbon, Portugal.

Member of the International Advisory Board of 7th International Conference on Green and Sustainable Chemistry, 5-8 Jul, Tokyo, Japan, and of 8th Green Solvents Conference, 16-19 Oct, Halle, Germany. Organizing Committee, PROSCIBA 2010 – II Iberoamerican Conference on Supercritical Fluids, April 5-9, Natal, Brasil; Coordinator of the Materials session. Organizing Committee, 3^o Nat Meeting of Physical Chemistry of the Sociedade Portuguesa de Química, FCT/UNL, 1997 and of SUPERGREENCHEM Workshop, FCT/UNL, 2005. Participation in the "Programa Ciência Viva" offering summer internships about Intelligent Polymers, since 2010. Coordinator of the Organizing Committee, Chemistry Day 2005 - "Who wants to be a chemist?" and Chemistry Day 2006 - "CSI Caparica". Organizer, 35th Conference cycle of the Chemistry Department, FCT/UNL, dedicated to "Chemistry put in use to....", January to March 2009.

Discussion Leader at Gordon Research Conference (GRC) on Green Chemistry, Bates College, Lewiston, Maine, 2008; at Gordon Research Seminars on Green Chemistry, Il Ciocco, Barga, Italy, 2012 and GRC on Green Chemistry, Il Ciocco, Barga, Italy, 2012.

Referee of articles (over 75) in scientific publications of ACS, Wiley, Elsevier and Taylor & Francis (e.g. ACS Appl. Mater. & Interfaces; Acta Biomaterialia; Anal. Chem.; Biomacromolecules; Carbohydrate Polym.; Desalination and Water Treatment; Fluid Phase Equilibria; Int. J. Pharmaceut.; J. Chem. Education; J. Chem. Eng. Data; J. Chem. Thermodyn.; J. Membrane Sci.; J. Supercrit. Fluids; Langmuir; Macromolecular Bioscience; Macromol. Symposia; Macromol. Reaction Eng.; Phys. Chem. Chem. Phys.; Polym. Chem.; Rev. Sci. Instrum.)

Selected Publications (out of 95)

- Silva, A.S.; Sous, A.M.; Cabral, R.P.; Silva, M.C.; Costa, C.; Miguel, S.P.; Bonifácio, V.D.B.; Casimiro, T.; Correia, I.J.; Aguiar-Ricardo, A. "Aerosolizable gold nano-in-micro dry powder formulations for theragnosis and lung delivery" *Int. J. Pharm* 519 (2017) 240–249. DOI: 10.1016/j.ijpharm.2017.01.032
- Restani, R. B.; Silva, A. S.; Pires, R. F.; Cabral, R.; Correia, I. J.; Casimiro, T., Bonifácio, V. D. B. and Aguiar-Ricardo, A. "Nano-in-Micro POxylated Polyurea Dendrimers and Chitosan Dry Powder Formulations for Pulmonary Delivery" *Part. Part. Syst. Charact.* **2016**, 33, 851-858. DOI:10.1002/ppsc.201600123
- Reis, T.C.; Castleberry, S.; Rego, A.M.B.; Aguiar-Ricardo, A.; Hammond, P.T. "Three-dimensional multilayered fibrous constructs for wound healing applications", *Biomater. Sci.* 2016, 4, 319-330. DOI: 10.1039/c5bm00211g
- Correia, V.G.; Ferraria, A.M.; Pinho, M. G.; Aguiar-Ricardo, A. "Antimicrobial Contact-Active Oligo(2-oxazoline)s-Grafted Surfaces for Fast Water Disinfection at the Point-of-Use", *Biomacromolecules* 2015, 16, 3904-3915. DOI: 10.1021/acs.biomac.5b01243
- Restani, R.B.; Conde, J.; Pires, R.F.; Martins, P.; Fernandes, A.R.; Baptista, P.V.; Bonifácio, V.D.B.; Aguiar-Ricardo, A. "POxylated Polyurea Dendrimers: Smart Core-Shell Vectors with IC50 Lowering Capacity", *Macromol. Biosci.* 2015, DOI: 10.1002/mabi.201500131
- Morgado, Patricia I.; Lisboa, Pedro F.; Ribeiro, Maximiano P.; Miguel, S.P.; Simões, P.C.; Correia, I.J.; Aguiar-Ricardo, A. "Poly(vinyl alcohol)/chitosan asymmetrical membranes: Highly controlled morphology toward the ideal wound dressing", *J. Membrane Sci.* 2014, 469, 262-271. Doi:10.1016/j.memsci.2014.06.035
- Barroso, Telma; Casimiro, Teresa; Ferraria, Ana M.; Mattioli, F.; Aguiar-Ricardo, A.; Roque A.C.A. "Hybrid Monoliths for Magnetically-Driven Protein Separations", *Adv. Funct. Mater.* 2014, 24, 4528-4541. DOI: 10.1002/adfm.201400022.
- Barroso, T.; Viveiros, R.; Casimiro, T.; Aguiar-Ricardo, A. "Development of dual-responsive chitosan-collagen scaffolds for pulsatile release of bioactive molecules", *J. Supercrit. Fluids* 2014, 94, 102-112. DOI: 10.1016/j.supflu.2014.07.005
- Restani, Rita B.; Conde, Joao; Baptista, Pedro V.; Cidade M.T.; Bragança A.M.; Morgado, J.; Correia, I.J.; Aguiar-Ricardo, A. "Polyurea dendrimer for efficient cytosolic siRNA delivery", *RSC Adv.* 2014, 4, 54872-54878. DOI: 10.1039/C4RA09603G
- Araújo M.; Viveiros, R.; Correia, T. R.; Correia, I. J.; Bonifácio, V.D.B.; Casimiro, T.; Aguiar-Ricardo, A. "Natural melanin: A potential pH-responsive drug release device", *Int. J. Pharm.* 2014, 469, 140–145. DOI: 10.1016/j.ijpharm.2014. 04.051.
- Barroso T, Lourenco A, Araujo M, Bonifácio VDB, Roque A.C.A.; Aguiar-Ricardo A. "A green approach toward antibody purification: a sustainable biomimetic ligand for direct immobilization on (bio)polymeric supports", *J. Mol. Recognit.* 2013, 26, 662-671. DOI: 10.1002/jmr.2309
- Raje, V.P.; Morgado, P.I.; Ribeiro, M.P.; Correia, I.J.; Bonifácio, V.D.B.; Branco, P.S.; Aguiar-Ricardo, A. "Dual On-Off and Off-On Switchable Oligoaziridine Biosensor", *Biosens. Bioelectron.*, 2013, 39, 64-69. DOI:10.1016/j.bios.2012.06.047
- Restani, R. B.; Morgado, P.I.; Ribeiro, M.P.; Correia, I.J.; Aguiar-Ricardo, A.; Bonifácio, V. D. B. "Biocompatible Polyurea Dendrimers with pH-Dependent Fluorescence", *Angew. Chem. Int. Ed.*, 2012, 51, 5162-5165. DOI: 10.1002/anie.201200362
- Barroso, T.; Viveiros, R.; Temtem, M.; Casimiro, T.; Bothelho do Rego, A.; Aguiar-Ricardo, A. "A combined strategy to surface-graft stimuli-responsive hydrogels using plasma activation and supercritical carbon dioxide", *ACS Macro Letters*, 2012, 1,356-360. DOI: 10.1021/mz200145w
- Correia, V.G.; Bonifácio, V.D.; Moutinho-Fragoso, G.; Casimiro, T.; Lobato da Silva, C.; Pinho, M.G.; Aguiar-Ricardo, A. "Oxazoline-Based Antimicrobial Oligomers: Synthesis by CROP Using Supercritical CO₂", *Macromolecular Biosci.* 2011, 11(8), 1128-1137. Highlighted in back-cover. DOI: 10.1002/mabi.201100126
- Temtem, M.; Pompeu, D.; Barroso, T.; Fernandes, J.; Simões, P.C.; Casimiro, T.; Botelho do Rego, A.M.; Aguiar-Ricardo, A. "Development and characterization of a thermoresponsive polysulfone membrane using an environmental friendly technology", *Green Chem.* 2009, 11, 638-645. DOI: 10.1039/B821495F

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Temtem, M.; Silva, L.M.C.; Andrade, P.Z.; Santos, F.; Lobato da Silva, C.; Cabral, J.M.S.; Abecasis, M.M.; Aguiar-Ricardo, A. "Supercritical CO₂ Generating Chitosan Devices with Controlled Morphology. Potential Application for Drug Delivery and Mesenchymal Stem Cell Culture", *J. Supercrit. Fluids* 2009, 48, 269-277. DOI:10.1016/j.supflu.2008.10.020

Temtem, M.; Casimiro, T.; Mano, J.F.; Aguiar-Ricardo, A. "Green Synthesis of a Temperature Sensitive Hydrogel", *Green Chem.* 2007, 9, 75-79. DOI: 10.1039/B603930H