Roberto Fernández Álvarez

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2016-Present

Charles University
PhD in Macromolecular Chemistry
Thesis: Synthesis of boron-containing polymeric nanostructures.

2014

University of Costa Rica
BSc Chemistry

2015

Universitat Autònoma de Barcelona
MSc Biochemistry, Biomedicine and Molecular Biology
Thesis: Nanoencapsulation of protein inhibitors and its application in the development of new therapies for gastric disease.

Working Experience

PhD researcher - Charles University **8/16-Present**

Handled multiple projects simultaneously in diverse topics including self-assembly of small molecules, their interaction with polymers, self-assembly of triblock terpolymers and synthesis of polyelectrolytes. Designed experiments and conducted research independently. Designed novel polyelectrolytes from scratch to perform as lithium ion conductors. Analyzed large data sets from different experimental techniques to explain out of the ordinary phenomena in polyelectrolytes. Handled writing of publications and grant submittals. Trained bachelor and master's students in synthesis and data analysis.

Master Student-Institute of Biotechnology and Biomedicine-UAB **9/14-10/15**
Protein Engineering and Proteomics Unit

Worked on the purification of Carboxypeptidase inhibitor obtained from recombinant expression on *P. Pastoris.* Optimized the encapsulation and co-encapsulation of the inhibitor with other proteins in PLGA nanocapsules for biotechnological applications. The properties of the nanocapsules were modified for different drug delivery characteristics. This work employed the use of enzymology techniques as well as nanotechnology techniques (DLS, SEM) for the correct characterization of the nanocapsules and its content.

Lecturer-Organic Chemistry I Laboratory-University of Costa Rica **3/14-7/14**

Worked as the coordinator of Organic Chemistry Laboratory course. Coordinated weekly meetings with lab assistants and other professors to ensure laboratory reagent needs and proper laboratory organization. Gave lectures to laboratory students and produced exams on weekly bases.

Research Associate- Organic Synthesis Laboratory-University of Costa Rica ***1/12-7/14***

Synthesized propargyl alcohols with various substrates using 1,3-dilithiopropyne; searched for a substitute stabilizing ligand for the 1,3-dilithiopropyne. Worked on modification of bile acids for potential development of antibiotics. This work employed Schlenk synthesis techniques, GC, and spectroscopic characterization (NMR, IR).

Internship-National Institute of Biodiversity (INBio)-Costa Rica ***8/13-12/13***

Professional internship in a multidisciplinary environment, worked at an intense rhythm to obtain extracts from plants and microbial ferments to meet deadlines of associated laboratories. Helped in the separation and isolation of secondary metabolites by TLC, CC, HPLC. Isolated fractions with antibacterial activity for further tests.

Skills

Technical	*Synthetic*	*Language*
Gas Chromatography **(GC)**	Function-oriented polymer design	English: C2
Mass Spectrometry **(MS, GC-MS)**	Ring Opening Polymerization	Czech: A2
Dynamic/Static Light Scattering (**DLS, SLS**)	RAFT polymerization	Spanish: C2
Differential Scanning Calorimetry (**DSC**)	Schlenk techniques	French: A2
NMR interpretation (**^{1}H, ^{13}C, ^{11}B, HSQC**)	Boron cluster chemistry	
X-ray diffraction (**XRD**)	Click chemistry (Azide-Alkyne cycloaddition)	
Isothermal Titration Calorimetry (**ITC**)		
Electron microscopy (**TEM, cryo-TEM**)		
Reverse Phase HPLC **(RP-HPLC)**		
Formulation of Nanoparticles		

Publications

Fernandez-Alvarez, R.; Hlavatovičová, E.; Rodzeń, K.; Strachota, A.; Kereïche, S.; Matějíček, P.; Cabrera-González, J.; Núñez, R.; Uchman, M. "Synthesis and self-assembly of a carborane-containing ABC triblock terpolymer: morphology control on a dual-stimuli responsive system" *Polym. Chem.* 10 (2019) 2774-2780.

Fernandez-Alvarez, R.; Nová, L.; Uhlík, F.; Kereïche, S.; Uchman, M.; Košovan, P.; Matějíček, P. "Interactions of star-like polyelectrolyte micelles with hydrophobic counterions" *J. Colloid Interface Sci.* 546 (2019) 371–380.

Fernandez-Alvarez, R.; Ďorďovič, V.; Uchman, M.; Matějíček, P. "Amphiphiles without Head-and-Tail Design: Nanostructures Based on the Self-Assembly of Anionic Boron Cluster Compounds." *Langmuir* 34 (2018) 3541-3554.

Fernandez-Alvarez, R.; Medoš, Ž.; Tošner, Z.; Zhigunov, A.; Uchman, M.; Hervø-Hansen, S.; Lund, M.; Bešter-Rogač, M.; Matějíček, P. "Total Description of Intrinsic Amphiphile Aggregation: Calorimetry Study and Molecular Probing" *Langmuir* 34 (2018) 14448-14457.

Li, J.; Janouskova, O.; **Fernandez-Alvarez, R.**; Mesíkova, S.; Tošner, Z.; Kereïche, S.; Uchman, M.; Matějíček, P. "Designed Boron-Rich Polymeric Nanoparticles Based on Nano-Ion Pairing for Boron Delivery" *Chem. Eur. J.* (2020)

Garcia-Guerrero, M. C.; Garcia-Pardo, J.; Berenguer, E.; **Fernandez-Alvarez, R**.; Barfi, G. B.; Lyons, P. J.; Aviles, F. X.; Huber, R.; Lorenzo, J.; Reverter, D. "Crystal structure and mechanism of human carboxypeptidase O: Insights into its specific activity for acidic residues" *PNAS* 115 (2018) E3932-E3939.

Lufrano, D.; Cotabarren, J.; Garcia-Pardo, J.; **Fernandez-Alvarez, R.**; Tort, O.; Tanco, S.; Avilés, F.X.; Julia, L.; Obregón, W.D. "Biochemical Characterization of a new carboxypeptidase inhibitor from a variety of Andean Potatoes." *Phytochemistry.* 120 (2015) 36-45.

Awards and Projects

- STARS- Supporting Talented PhD Research Students (2016-2020)- Scholarship recipient

- GAUK- Grant Agency Charles University Student (2017-2020)-Main Grant recipient
  Title: Preparation of polymeric nanostructures via non-covalent interactions of carborane clusters
- GAČR- Czech Science Foundation (2016-2019)- 17-00289Y- Contributing researcher
  Title: Sugar and pH-responsive multicompartment nano-assemblies for dual-drug solubilization and delivery
- GAČR- Czech Science Foundation (2016-2019) 17-00648S- Contributing researcher
  Title: Chaotrope, hydrotrope or surfactant? Anionic boron cluster compounds in water and in complexes with polymers

Conferences and Seminars

- *Euroboron8 (2019) – Montpellier*
  Oral presentation
  Fernandez Alvarez, R.; Uchman, M.; Matejicek. P. *Metallacarboranes and dodecaborate clusters for the production of single Li-Ion polymer conductors.*

- *Polymer Design Function and Application (PDFA 2018) - Barcelona*
  Poster Presentation
  Fernandez-Alvarez, R.; Hlavatovicova, E.; Mateǰícek, P.; Rodzeń, K.; Strachota, A.; Nuñez, R.; Uchman. M. *Synthesis of carborane containing triblock Terpolymer designed for dual drug deliver*

- *Boron chemistry meeting in the Americas (BORAM XVI 2018)-Boston*
  Poster Presentation
  Fernandez Alvarez, R.; Uchman, M.; Matejicek. P. *Incorporation of metallacarborane groups in polymer backbone for their use as single Lithium-Ion conductors.*

- *Student Colloid Conference (ESC 2017) - Florence*
  Poster Presentation
  Fernandez-Alvarez, R.; Matejicek P. *PS-P2VP micelles as high load carriers of Metallacarboranes*

- *IMEBORON16 (2017)- Hong Kong*
  Poster Presentation
  Fernandez-Alvarez, R.; Uchman, M.; Matejicek, P. *Counterion Effect on Thermodynamics of Metallacarborane Self-Assembly*

- *Scientific day of the Department of Biochemistry and Molecular Biology 2015-Barcelona*
  Poster Presentation
  Fernandez-Alvarez, R.; García-Pardo, J.; Martínez, D.; Avilés, F.X.; Novio, F.; Lorenzo, J. *Development of new therapies for biomedical applications by nanoencapsulation of NvCI in PLGA*