

CURRICULUM VITAE ABREVIADO (CVA)

Part A. PERSONAL INFORMATION

First name	Idoia		
Family name	Ruiz de Larramendi		
Gender (*)	Female	Birth date	██████████
Social Security, Passport, ID number	██████████		
e-mail	Idoia.ruizdelarramendi@ehu.eus	URL Web	
Open Researcher and Contributor ID (ORCID) (*)	0000-0002-4179-7357		

(*) Mandatory

A.1. Current position

Position	Senior Lecturer (Titular)		
Initial date	2018/10/09		
Institution	Universidad del País Vasco UPV/EHU		
Department/Center	Química Orgánica e Inorgánica / Facultad de Ciencia y Tecnología		
Country	Spain	Teleph. number	946012705
Key words	Materials, Chemistry, Energy storage, Electrochemistry		

A.2. Previous positions (research activity interruptions, indicate total months)

Period	Position/Institution/Country/Interruption cause
2013 – 2018	Profesorado Agregado (Permanente) / UPV/EHU / Spain
2010 – 2013	Profesorado Adjunto (Ayudante Doctor) / UPV/EHU / Spain
2009 – 2010	Profesorado Laboral interino / UPV/EHU / Spain
2008 – 2009	Postdoctoral Researcher / UPV/EHU / Spain
2003 – 2007	Predocctoral Researcher / UPV/EHU / Spain

A.3. Education

PhD, Licensed, Graduate	University/Country	Year
PhD in Chemistry	Universidad del País Vasco UPV/EHU	2007
Licenciatura en CC Químicas	Universidad del País Vasco UPV/EHU	2001

Part B. CV SUMMARY

I received the Degree in Chemistry (2001) from the University of the Basque Country (UPV/EHU) and completed my PhD in Chemistry (2007) in the UPV/EHU awarded with the "Extraordinary PhD award". My Doctoral Thesis under the supervision of Prof. Teófilo Rojo (UPV/EHU) and J.C. Grenier (ICMCB-France) focused on the development of new materials with perovskite-type structure for application as cathodes in solid oxide fuel cells (SOFC). Since then, I have continued my research and teaching career in the Inorganic Chemistry Department (UPV/EHU) as postdoctoral researcher (2008–2010), associate professor (2010–2018) and senior lecturer (2018 – present). For more than 15 years, my research activity has been related to the interdisciplinary and multidisciplinary field of materials science, both as academic and technologically oriented work. From 2019, I co-lead the research group devoted to developing and understanding low cost and environmentally friendly advanced materials for the next generation of energy conversion and storage devices (fuel cells, batteries, and capacitors). I have participated in more than 15 projects, acting as principal investigator in two national and two regional projects, all of them focusing on the development of materials for energy storage systems. I have presented more than 80 works in congresses, I hold one patent, and I have authored of more than 65 peer-reviewed articles in prestigious journals, mainly related to 3 research lines, being the following the most notable contributions:

1. Design of nanostructured systems for recovery of ions in solution

With functionalized magnetic nanoparticles it has been possible to recover precious metals from automobile catalysts. In collaboration with the group led by Prof. W. Parak (Philipps

University of Marburg), the degradation processes of the polymeric environments of functionalized gold nanoparticles have been studied both in vitro and in vivo and the results have been published in the prestigious journal Nature Nanotechnology.

2. Mixed oxides with perovskite-type structure for SOFC

A SOFC prototype has been developed in a single chamber where it is not necessary to separate the gases, reducing the operating temperatures of the system below 700 °C, being one of the first cells tested at intermediate temperatures at laboratory scale. Likewise, the formation of secondary phases in the materials with general formula $\text{Ln}_{1-x}\text{Ca}_x\text{Fe}_{0.8}\text{Ni}_{0.2}\text{O}_3$ ($\text{Ln} = \text{La}, \text{Pr}$) has been demonstrated, which allowed explaining the extraordinary electrochemical behaviour they exhibited. On the other hand, carbon nanotubes have been used in the preparation of perovskite-type compounds obtaining nanoparticles of 16 nm (specific area = 150 m²/g) with low polarization resistances even at temperatures of 600 °C. Another milestone achieved in this field is the obtaining of nanostructured materials and nanocomposites of high electrocatalytic area achieving improvements of more than one order of magnitude in the operation of the electrode.

3. New materials for metal-air/O₂ batteries

The analysis of the operation of these devices (know-how) has been deepened through an exhaustive study of the ORR and OER reactions that take place in the cathode of M-air/O₂ batteries (Li and Na). In order to study the reaction mechanisms that take place between the electrode, the oxygen and the metal cations, impedance spectroscopy has been used for the *in-situ* monitoring of these reactions. Likewise, an *in-operando* cell for UV/visible spectroscopy has been designed to analyse the operation of redox mediators. The instability of the discharge products in the batteries has been demonstrated and the microstructure and chemical composition of the discharge products in Na-O₂ batteries have been explored. In recent years, the effect of different additives on the electrochemical response of these batteries has been analysed, among which the redox mediator ethyl viologen and lithium and potassium salts stand out.

My main motivation is to unravel and understand the properties of materials through multi-technical approaches. I combine materials development with a wide range of characterization techniques to achieve application-oriented optimization. With a keen interest in sustainable development, I aspire to advance the field of energy storage with the goal of accelerating market adoption of low-carbon technologies.

Part C. RELEVANT MERITS (sorted by typology)

C.1. Publications (see instructions)

- 1 B. Acebedo, M.C. Morant-Miñana, E. Gonzalo, **I. Ruiz de Larramendi**, A. Villaverde, J. Rikarte, L. Fallarino, 2023, Current status and future perspective on Lithium Metal Anode production methods, *Adv. Energy Mater.*, article in advance.
- 2 Y. Wang, E. Goikolea, **I. Ruiz de Larramendi**, S. Lanceros-Méndez, Q. Zang, 2022, Recycling methods for different cathode chemistries – A critical review, *J. Energy Storage*, 56: 106053.
- 3 J.L. Gómez-Cámer, **I. Ruiz de Larramendi**, M. Enterría, I. Lozano, B. Acebedo, D. Bordeau, N. Ortiz-Vitoriano, 2022, Alternative anodes for Na–O₂ batteries: the case of the Sn₄P₃ alloy, *J. Mater. Chem. A*, 10: 2398-2411.
- 4 **I. Ruiz de Larramendi**, I. Lozano, M. Enterría, R. Cid, M. Echeverría, S. Rodríguez Peña, J. Carrasco, H. Manzano, G. Beobide, I. Landa-Medrano, T. Rojo, N. Ortiz-Vitoriano, 2022, Unveiling the role of tetrabutylammonium and cesium bulky cations in enhancing Na–O₂ battery performance, *Adv. Energy Mater.*, 12: 2102834.
- 5 N. Ortiz-Vitoriano, **I. Ruiz de Larramendi**, R.L. Sacci, I. Lozano, C.A. Bridges, O. Arcelus, M. Enterría, J. Carrasco, T. Rojo, G.M. Veith, 2020, Goldilocks and the three glymes: How Na⁺ solvation controls Na–O₂ battery cycling, *Energy Storage Mater.*, 29: 235-245.
- 6 E. Goikolea, V. Palomares, S. Wang, **I. Ruiz de Larramendi**, X. Guo, G. Wang, T. Rojo, 2020, Na-Ion Batteries—Approaching Old and New Challenges, *Adv. Energy Mater.*, 10: 2002055.

- 7 I. Landa-Medrano, A. Sorrentino, L. Stievano, **I. Ruiz de Larramendi**, E. Pereiro, L. Lezama, T. Rojo, D. Tonti, 2017, Architecture of Na-O₂ battery deposits revealed by transmission X-ray microscopy, *Nano Energy*, 37:224-231.
- 8 I. Landa-Medrano, R. Pinedo, X. Bi, **I. Ruiz de Larramendi**, L. Lezama, J. Janek, K. Amine, J. Lu, T. Rojo, 2016, New Insights into the Instability of Discharge Products in Na-O₂ Batteries, *ACS Appl Mater Interfaces*, 8:20120-20127.
- 9 I. Landa-Medrano, M. Olivares-Marín, R. Pinedo, **I. Ruiz de Larramendi**, T. Rojo, D. Tonti, 2015, Operando UV-visible spectroscopy evidence of the reactions of iodide as redox mediator in Li-O₂ batteries, *Electrochem. Commun.*, 59:24-27.
- 10 I. Landa-Medrano, R. Pinedo, **I. Ruiz de Larramendi**, N. Ortiz-Vitoriano, T. Rojo 2015, Monitoring the location of cathode-reactions in Li-O₂ batteries, *J. Electrochem. Soc.*, 162:A3126-A3132.

C.2. Congress

Contributions to scientific meetings: 80 (poster, oral and invited talk)

Member of the organizing committee of the XXXVII Biennial Meeting of the Spanish Royal Society of Chemistry (Symposium 11: Advanced Inorganic Systems) National Conference held in 2019 from the 26th to the 30th of May in Donostia-San Sebastian (Spain).

C.3. Research projects

1. Title: Tecnologías y materiales avanzados para nuevas formas de generación y almacenamiento de energía. Funding Body: Gobierno Vasco – UPV/EHU ; Project SAIOTEK; S-PE11UN064 GENYAL. Participating Organization: UPV/EHU. Duration, from: 1/1/2011 to: 31/12/2012. Grant: 21.647 € PI: Teófilo ROJO (Miembro del equipo de investigación)
2. Title: Materiales nanoestructurados de interés tecnológico y biomédico. Funding Body: MEC, MAT2010-19442 Participating Organization: UPV/EHU. Duration, from: 1/1/2011 to: 31/12/2013 Grant: 302.500 € PI: Teófilo ROJO (Miembro del equipo de investigación)
3. Title: Energías renovables, pilas de combustible y baterías, una cadena de valor. Funding Body: Gobierno Vasco – UPV/EHU; Proyecto SAIOTEK; S-PE12UN140 ENERGIBA Participating Organization: UPV/EHU. Duration, from: 1/1/2012 to: 31/12/2013 Grant: 34.195,44 € PI: Teófilo ROJO (Miembro del equipo de investigación)
4. Title: Tecnologías y materiales avanzados para nuevas formas de generación y almacenamiento de energía. Funding Body: Gobierno Vasco; Proyecto ETORTEK; ENERGIGUNE12 Participating Organization: UPV/EHU. Duration, from: 01/01/2012 to: 31/12/2014 Grant: 66.660 € PI: **Idoia RUIZ DE LARRAMENDI**
5. Title: Optimización de Materiales Nanoestructurados con Aplicaciones de Interés Tecnológico y Biomédico. Funding Body: Gobierno Vasco. Grupo Consolidado IT 570-13 Participating Organization: UPV/EHU Duration, from: 01/01/2013 to: 31/12/2018 Grant: 522000 € PI: Teófilo ROJO (Miembro del equipo de investigación)
6. Title: Diseño de materiales avanzados para sistemas electroquímicos de conversión y almacenamiento de energía: una aproximación nanotecnológica. Funding Body: Ministerio de Economía y Competitividad, MAT2013-41128-R Participating Organization: UPV/EHU Duration, from: 01/01/2013 to: 31/12/2016 Grant: 155102 € PI: Luis LEZAMA (Miembro del equipo de investigación)
7. Title: Desarrollo de actividades de investigación fundamental estratégica en almacenamiento de energía electroquímica y térmica. Funding Body: Gobierno Vasco. ELKARTEK CICE2017 Participating Organization: UPV/EHU Duration, from: 01/03/2017 to: 31/12/2018 Grant: 94579,10 € PI: **Idoia RUIZ DE LARRAMENDI**
8. Title: Materiales Nanoestructurados para Aplicaciones en Energía y Salud: Desarrollo y Funcionalización. Funding Body: Ministerio de Economía y Competitividad, MAT2016-78266-P Participating Organization: UPV/EHU Duration, from: 01/01/2017 to: 31/12/2019 Grant: 150102 € PI: Luis LEZAMA (Miembro del equipo de investigación)
9. Title: Explorando materiales avanzados: un enfoque racional para baterías y condensadores híbridos basados en sodio. Funding Body: Ministerio de Economía y Competitividad, PID2019-107468RB-C21 Participating Organization: UPV/EHU Duration, from: 01/06/2020 to: 31/05/2023 Grant: 145200 € PI: Teófilo ROJO e **Idoia RUIZ DE LARRAMENDI**

- 10.** Title: Diseño racional de materiales avanzados para baterías y condensadores híbridos acuosos de alto rendimiento basados en zinc. Funding Body: Ministerio de Ciencia e Innovación, TED2021-131517B-C21 Participating Organization: UPV/EHU + INCAR. Duration, from: 01/12/2022 to: 31/11/2024 Grant: 120000 € PI: **Idoia RUIZ DE LARRAMENDI** y Eider GOIKOLEA

C.4. Contracts, technological or transfer merits

1. Inventors: J. Lago, **I. Ruiz de Larramendi**, T. Rojo. Title: Nuevos compuestos con valores colosales del campo de exchange bias, procedimiento de obtención y sus usos. N. de solicitud: PCT/ES2015/070228 País de prioridad: ES Fecha de prioridad: 2015. UPV/EHU.
2. Inventors: B. Acebedo, S. Devaraj, E. Gonzalo, A. Villaverde, M. Armand, **I. Ruiz de Larramendi**, T. Rojo. Title: Anode-Free Electrochemical Cell. Application Number: EP22383285.8 Application Date: 23rd December 2022. UPV/EHU + CICenergiGUNE.