MINISTERIO DE CIENCIA E INNOVACIÓN | Financiado por la Unión Europea NextGenerationEU | Plan de Recuperación, Transformación y Resiliencia | AGENCIA ESTATAL DE INVESTIGACIÓN

CURRICULUM VITAE (CVA)

IMPORTANT – The Curriculum Vitae cannot exceed 4 pages. Instructions to fill this document are available in the website.

CV date	25-11-2022

Part A. PERSONAL INFORMATION

First name	MANUEL		
Family name	ÁLVAREZ GUERRA		
Gender (*)		Birth date (dd/mm/yyyy)	
e-mail	alvarezgm@unican.es	URL Web : https://web.unican.es/portal-investigador/personal-investigador/detalle-investigador?i=7F780911500E06C4	
Open Research and Contributor ID (ORCID)(*)		0000-0002-3546-584X	

(*) Mandatory

A.1. Current position

Position	Profesor Titular de Universidad		
Initial date	25/11/2019		
Institution	Universidad de Cantabria		
Department/Center	Dpto. Ingenierías Química y Biomolecular		
Country	Spain	Teleph. number	+34 942201595
Key words	CO2 electrochemical conversion; modelling ionic liquids		

A.2. Previous positions (research activity interruptions, art. 45.2.b))

No situations that have interrupted the research activity according to art. 45.2.b. of the call.

Period	Position/Institution/Country/Interruption cause
2016 –2019	Associate Professor ("Profesor Contratado Doctor interino"/ "Profesor Contratado Doctor") / Universidad de Cantabria / Spain
2011 –2016	Assistant Professor ("Profesor Ayudante Doctor") / Univ. Cantabria / Spain

A.3. Education

PhD, Licensed, Graduate	University/Country	Year
PhD with European Mention, Chemical and Process Engineering	Universidad de Cantabria (UC)	2010
Master in Chemical Engineering "Sustainable Production & Consumption"	Universidad de Cantabria (UC)	2008
Chemical Engineer	Universidad de Cantabria (UC)	2005

Part B. CV SUMMARY *(max. 5000 characters, including spaces)*

I obtained the title of Chemical Engineer in Universidad de Cantabria (UC) in September 2005 with an average mark of "sobresaliente" (9.03/10) and with the Award ("Premio Extraordinario Fin de Carrera") for the most outstanding graduate student. Then, I was awarded a F.P.U. fellowship by MEC to do the PhD thesis in the Dept. of Chemical Engineering of UC. During my PhD I carried out research stays in the University of Copenhagen (Denmark) and in Imperial College London (UK). In January 2010 I presented my Doctoral Thesis, obtaining "sobresaliente cum laude" and the European Mention.

After finishing the PhD, I joined the DePRO group of UC headed by Prof. A. Irabien to start the postdoctoral work starting a new line of research focussed on CO_2 valorisation. During the start-up of this new line, using the experience in advanced chemometric tools gained during the doctoral stage, I worked in the development of models to estimate the ecotoxicity of ionic liquids. The most outstanding result of this work was a publication in *Green Chem* (2011, 13,

1507–1516). I have also carried out a postdoctoral research stay in Dept. of Chemical Engineering of Imperial College London (UK), in the framework of the Programme "José Castillejo" of the Ministry of Education.
My current research activity is mainly focused on the development and assessment of innovative processes for the electrochemical conversion of CO_2 into valuable products. The research work carried out so far has resulted in many papers in international peer-reviewed journals and in multiple contributions to international conferences, having taken part as well in more than ten research projects funded in public competitive calls, one of them as co-PI. Two "sexenios de investigación" (six-year research periods) were recognised in 2018.
Within the framework of my participation in the R&D projects ENE2010-14828 and CTQ2013-48280-C3-1-R, whose IP was Prof. A. Irabien, important scientific contributions were made on innovative processes both for the direct electroreduction of CO_2 to formate using catalysts based on Pb and Sn, and for the electrosynthesis of organic carbonates (DMC) using CO_2 as raw material. The articles published in *Chem Eng J* (2012, 207-208, 278-284) and in *Chem Eng Res Des* (2014, 92, 692-701), of which I was the first author, represent the first works of the DePRO research group in CO_2 electrovalorisation processes, a field in which this group has achieved international recognition. Two review papers were published in 2015 in JCR journals with very high impact (*Energy Environ Sci*, and *Green Chem*).
Relevant contributions have been made more recently to the improvement of continuous processes for the electroreduction of CO_2 to formate using novel configurations of reactor and electrodes, within the framework of project CTQ2016-76231-C2-1-R, in which I was a research team member, and currently of the coordinated project PID2019-108136RB-C31, of which I am co-IP. The excellent progress achieved has allowed relevant publications, such as *Chem Eng J* (2021, 405, 126965) in collaboration with the Univ. of Alicante, which represented the best trade-off between formate concentration, Faradaic Efficiency and energy consumption in the literature. As the result of collaboration with internationally recognised groups, such as those of Prof. A. Mendes (U. Porto) or C. Sánchez-Sánchez (Sorbonne Université), interesting achievements have also been recently diffused in relevant journals (*Appl Catal B- Environ*, *Chem Eng J*).
Regarding formation of young researchers, I have already co-supervised 3 PhD thesis in the field of the electrochemical valorisation of CO_2: Dr. I. García-Herrero (presented Dec 2015), Dr. A. Del Castillo (July 2018) and Dr. G. Díaz-Sainz (May 2021), and another one (K. Fernández) is in progress. I have also (co)supervised 9 Master students "Trabajos Fin de Máster" and 22 End of Degree Projects. I was invited editor for Special Issue in J Chem Technol Biotechnol and I cooperate with multiple international journals as reviewer, and as evaluator for ANEP, serving, e.g. as member of the Commission CTQ-JCI -2019 ("Juan de la Cierva Incorporación" grants).
My commitment in contributions to society is strong, having participated in many dissemination activities like talks in schools, the "Science Week" or the "European Researchers' Night". I also collaborate as organiser and member of the jury of the Chemistry "Olimpiada" and "Miniolimpiada" in Cantabria since 2016. I have taught more than 1800 hours of lectures in subjects of Degree & Master in Chemical Engineering, and since October 2019 I am the Coordinator of the Doctorate Programme in Chemical Engineering, Energy and Processes of UC. Moreover, among other management activities and institutional responsibilities, I have been Founding Member and, currently, President of Association of Chemistry & Chemical Engineering of Cantabria (AQUIQÁN).

Part C. RELEVANT MERITS *(sorted by typology)*

C.1. Most important publications in journals with "peer review" - last 10 years

1) C. Azenha, C. Mateos-Pedrero, M. Alvarez-Guerra, A. Irabien, A. Mendes. "Binary copper-bismuth catalysts for the electrochemical reduction of CO2: Study on surface properties and catalytic activity". *Chemical Engineering Journal*, **2022**, 445, 136575.
2) I. Merino-Garcia, L. Tinat, J. Albo, M. Alvarez-Guerra, A. Irabien, O. Durupthy, V. Vivier, C.M. Sánchez-Sánchez, "Continuous electroconversion of CO_2 into formate using 2 nm tin oxide nanoparticles". *Applied Catalysis B: Environmental*, **2021**, 297, 120447.
3) G. Díaz-Sainz, M. Alvarez-Guerra, B. Ávila-Bolívar, J. Solla-Gullón, V. Montiel, A. Irabien. "Improving trade-offs in the figures of merit of gas-phase single-pass continuous CO_2 electrocatalytic reduction to formate". *Chemical Engineering Journal,* **2021**, 405, 126965.
4) G. Díaz-Sainz, M. Alvarez-Guerra, J. Solla-Gullón, L. García-Cruz, V. Montiel, A. Irabien. "CO_2 electroreduction to formate: Continuous single-pass operation in a filter-press reactor at high current densities using Bi gas diffusion electrodes". *Journal of CO2 Utilization*, **2019**, 34, 12-19.
5) A. Irabien, M. Alvarez-Guerra, J. Albo, A. Dominguez-Ramos. "Electrochemical Conversion of CO2 to Value-Added Products" In: "*Electrochemical water and wastewater treatment*" (Eds: C.A. Martínez-Huitle, M.A. Rodrigo, O. Scialdone). **2018**. Elsevier, Butterworth-Heinemann, Oxford, UK.
ISBN: 978-0-12-813160-2
6) A. Del Castillo, M. Alvarez-Guerra, J. Solla-Gullón, A. Sáez, V. Montiel, A. Irabien. "Sn nanoparticles on gas diffusion electrodes: Synthesis, characterization and use for continuous CO_2 electroreduction to formate". *Journal of CO2 Utilization*, **2017**, 18, 222-228.
7) I. Garcia-Herrero, R. M. Cuéllar-Franca, V.M. Enríquez-Gutiérrez, M. Alvarez-Guerra, A. Irabien, A. Azapagic. "Environmental Assessment of Dimethyl Carbonate Production: Comparison of a Novel Electrosynthesis Route Utilizing CO2 with a Commercial Oxidative Carbonylation Process". *ACS Sustainable Chemistry & Engineering*, **2016**, 4, 2088-2097.
8) M. Alvarez-Guerra, J. Albo, E. Alvarez-Guerra, A. Irabien. "Ionic liquids in the electrochemical valorisation of CO_2". *Energy & Environmental Science*, **2015**, 8, 2574–2599.
9) A. Del Castillo, M. Alvarez-Guerra, J. Solla-Gullón, A. Sáez, V. Montiel, A. Irabien. "Electrocatalytic reduction of CO_2 to formate using particulate Sn electrodes: Effect of metal loading and particle size". *Applied Energy*, **2015**, 157, 165-173
10) M. Alvarez-Guerra, S. Quintanilla, A. Irabien. "Conversion of carbon dioxide into formate using a continuous electrochemical reduction process in a lead cathode". *Chemical Engineering Journal*, **2012**, 207-208, 278-284.

C.2. Congress

Over sixty communications in peer-reviewed, internationally established conferences, most of them as oral presentations, in the last 10 years. Some relevant invited presentations:

- Invited speaker to **"Round-table on Innovation"** (with A. Stankiewicz (TU Delft), among other invited speakers)**.** *9th European Congress of Chemical Engineering*. The Hague, NL. 2013.
-5 invited presentations (2015-2019) in the international advanced school *"International Sotacarbo Summer School on CCUS Technologies",* organized by Sotacarbo Sustainable Energy Research Center and ENEA, with talks on electrochemical processes for CO_2 conversion. Carbonia, Sardinia, Italy.
-Keynote speaker: "CO_2 to useful products: electrochemical processes for carbon utilisation". *Hyceltec 2017-VII Symposium on Hydrogen, Fuel Cells and Advanced Batteries.* Porto, Portugal, 2017
-Invited speaker: "Valorización electroquímica de CO_2: Desarrollo de procesos continuos para la obtención de formiato". 3rd "Aportando Valor al CO2", organised by PTECO2 (Plataforma Tecnológica Española del CO2) and SusChem, Madrid, Spain. 2019.
-Invited speaker: "Improving continuous processes for the electrochemical conversion of CO_2 to formate". First International Conference on Solar Power Technologies SPTech. Online/Porto. 2021

Organization of scientific congresses:

-Co-president of the Organising Committee of XLII Meeting of the RSEQ Electrochemistry Specialized Group (42 GERSEQ 2022). >150 participants. 6-8 July 2022. Santander, Spain.
- President of the Organising Committee and member of Executive Committee of ANQUE-ICCE "3rd International Congress of Chemical Engineering". 512 participants. 19-21 June 2019. Santander, Spain.
-Member of the Organising Committee of IV Congress of Teaching Innovation in Chemical Engineering (IV CIDIQ). 150 participants. 21-23 January 2018. Santander, Spain.
- Member of the Student Committee of the "10th World Congress of Chemical Engineering".> 3000 participants. 30 September- 2 October 2017. Barcelona, Spain.
- Member of the Organising Committee of the "XXXIV Biennial Meeting of the Spanish Royal Society of Chemistry" ("Reunión Bienal de la Real Sociedad Española de Química", RSEQ). 956 participants. Spain. 15-18 September 2013.

C.3. Projects or research lines in which you have participated- last 10 years

1) PID2019-108136RB-C31 "CO_2 capture optimization using novel biopolymer-based membranes and utilisation processes for coupling CO_2 electrovalorization to relevant oxidations under sustainability criteria". Proy. I+D+i-Retos Investigación 2019. Ministerio de Ciencia e Innovación – Agencia Estatal de Investigación. PI: Aurora Garea Vázquez / Manuel Álvarez Guerra, UC. From: 01/06/2020 to 31/05/2023. Funding: 234.740 €. **Participation as Principal Investigator**

2) CTQ2016-76231-C2-1-R "Multiscale Design of Carbon Capture and Utilisation Processes". Proy. I+D+i-Retos 2016. Ministerio de Economía, Industria y Competitividad. PI: J. Angel Irabien Gulías / Aurora Garea Vázquez, UC. From: 30/12/2016, to: 29/12/2020. Funding: 320.650 €.
Participation as member of the research team.

3) CTQ2014-55716-REDT "Excellence Network: Sustainable Chemical Valorisation of Carbon Dioxide (VALCO2)" Acciones de dinamización "Redes de Excelencia". 2014 Call. Ministerio de Economía y Competitividad. PI: Angel Irabien Gulías, UC.
From: 01/01/2015, to: 31/12/2016. Funding: 28.000 €.
Participation as researcher member of the working team.

4) CTQ2013-48280-C3-1-R "Development and Integration of Processes with Membranes for Carbon Dioxide Capture and Valorisation". Proy.I+D+i-Retos 2013.Ministerio Economía y Competitividad PI: J. Angel Irabien Gulías, UC. From: 01/01/2014, to: 31/12/2016. Funding: 348.480 €.
Participation as researcher member of the working team.

5) "GreenTech: the application of green technologies for sustainable water purification and reuse". MINECO, Project Eranets-NEW INDIGO- DST (PRI-PIMNIN-2011-1462). PI: Inmaculada Ortiz Uribe, UC. From: 01/06/2012, to: 01/06/2014. Funding: 40.000 €
Participation as member of the research team.

6) ENE2010-14828 "Development of a CO_2 capture and recycling process" Plan Nacional I+D+i 2010. Ministerio de Ciencia e Innovación. PI: J. Angel Irabien Gulías, UC.
From: 01/01/2011, to: 31/12/2013. Funding: 278.300 €.
Participation as member of the research team.

C.4. Participation in technology/knowledge transfer activities and exploitation of results.

Contract: "Ensayos e informes de caracterización de muestras sólidas y líquidas mediante ensayos físico-químicos". Funding: Multiple companies. PI: J. Ángel Irabien Gulías, UC.
Duration: from 18/02/2008 to 31/12/2014. Funding: 163.037,66 €.