

## CURRICULUM VITAE ABREVIADO (CVA)

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

### Part A. PERSONAL INFORMATION

First name	FRANCISCO		
Family name	PONTIGA ROMERO		
Gender (*)	Male	Birth date (dd/mm/yyyy)	
ID number			
e-mail		URL Web: <a href="https://www.us.es/trabaja-en-la-us/directorio/francisco-de-paula-pontiga-romero">https://www.us.es/trabaja-en-la-us/directorio/francisco-de-paula-pontiga-romero</a>	
Open Researcher and Contributor ID (ORCID) (*)	0000-0003-1182-3240		

(\*) *Mandatory*

#### A.1. Current position

Position	Full Professor		
Initial date	22/11/2018		
Institution	Universidad de Sevilla		
Department/Center	Departamento de Física Aplicada II		
Country	Spain	Telephone number	
Key words	Powder fluidization, CO2 capture, dielectric barrier discharge, EHD		

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

Period	Position/Institution/Country/Interruption cause
17/03/1995 to 21/11/2018	Associate Professor/Universidad de Sevilla/Spain
10/06/1991 to 16/03/1995	Assistant Professor/Universidad de Sevilla/Spain

#### A.3. Education

PhD, Licensed, Graduate	University/Country	Year
PhD in Physics	Universidad de Sevilla/Spain	1992
Bachelor thesis in Physics	Universidad de Sevilla/Spain	1988
Degree in Physics	Universidad de Sevilla/Spain	1986

(Include all the necessary rows)

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

Francisco Pontiga is a member of the Group of Electrohydrodynamics and Cohesive Granular Media of the University of Seville (Spain). He is currently a Professor at the Department of Applied Physics.

He started his research activity in Electrohydrodynamics (EHD) under the supervision of Prof. Antonio Castellanos. He completed his doctoral thesis on the study of the linear stability of dielectric liquids subjected to electric fields and thermal gradients, which is a problem of interest in the design of efficient heat transfers. That study revealed the physical mechanisms of instability associated with the injection of charge, with the generation of ions by dissociation, and with the thermal dependence of the ionic mobility and the liquid permittivity. At that time, he carried out several research stays in the Department of Engineering Mathematics (University of Bristol, UK) and in the Laboratory of Electrostatics and Dielectric Materials of the CNRS (Grenoble, France). After his Ph.D., he participated in other investigations in EHD, such as the study of the linear stability of the plane Poiseuille flow and the Taylor-Couette flow when they are subjected to charge injection. In later works, he addressed the problem of electrical conduction in nonpolar liquids with models that encompassed both the phenomena of injection of charge and dissociation, which are essential to correctly evaluate the



injected charge density. The predicted current-voltage characteristics curves showed excellent agreement with measurements for electric fields up to 1 MV/m.

A postdoctoral stay in the Dpt. of Engineering Physics of McMaster University (Canada), under the supervision of Prof. Jen Shih Chang, contributed decisively to consolidating its interest on electrical discharges in gases. In this line, efficient algorithms for the simulation of transient discharges (e.g. streamers, Trichel pulses, etc.) were developed using particle-in-cell methods and finite elements. Theoretical, numerical, and experimental research on DC corona discharge and nanosecond-pulsed corona discharge were also conducted in different gases ( $O_2$ ,  $N_2$ ,  $CO_2$ ,  $SF_6$ , etc.) with the aim of investigating the ability of this type of discharge to generate chemical species and radicals of technological interest. The EHD motion of the gas induced by the electrical discharge has also been considered in order to determine its effect on the spatial distribution of species generated by the electrical discharge.

The increasing concern for  $CO_2$  emissions and its responsibility for global warming has led him to take interest on the efficient decomposition of  $CO_2$  using dielectric barrier discharge (DBD) stimulated by conventional AC voltage or nanosecond pulses. Complementary, in the area of granular media, he has investigated the chemisorption of  $CO_2$  in fluidized beds of  $Ca(OH)_2$ . Among other results, it was shown that mixing  $Ca(OH)_2$  with  $SiO_2$  nanoparticles improves fluidization and results in a substantial augmentation in  $CO_2$  adsorption capacity, which can be further increased by exposing  $Ca(OH)_2$  to high humidity during storage. These results are of particular interest for the feasibility of  $CO_2$  direct air capture (DAC), which is currently the subject of intense research.

He has co-supervised three doctoral thesis, and he has actively cooperated with research groups of different universities and research centers (University of Bristol -UK-, CNRS of Grenoble -France-, Comenius University -Slovakia-, University College London -UK-, Tiaret University -Algeria-).

He has been principal investigator in 6 competitive research projects (two national projects, three bilateral projects (Spain-Algeria) and one regional project), and has participated as a member of the research team in 12 research projects (nine national projects, two European projects and one regional project)

He is co-author of 38 papers in international JCR journals (such as Powder Technology, Chemical Engineering Journal, Journal of Physics D: Applied Physics, Plasma Sources Science and Technology, Physical Chemistry Chemical Physics, Physics of Fluids, Journal of Computational Physics, etc.) which are ranked in the top third of JCR (many of them Q1 or close to such quartile). He is also co-author of 96 contributions in international conferences, most of them published as conference proceeding articles and book chapters. As a result of his research trajectory, he has four *sexenios de investigación* (four positively evaluated six-year research terms).

According to the bibliometric indicators of research impact in WOS, his scientific production has received 782 total citations and has a Hirsch index  $H=17$ . In Scopus, these metrics are 907 total citations and  $H=18$ , respectively.

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

### **C.1. Publications in peer-reviewed books, journals and conferences** (10 most relevant contributions)

1. F.J. Durán-Olivencia, M.A. Martín-Alfonso, F. Pontiga, C. Soria-Hoyo, H. Moreno, J.M. Valverde (2025) Nanoadditives to mitigate jamming in cohesive granular media, *Powder Technology* **456**:120756. Doi: 10.1016/j.powtec.2025.120756
2. J. Canivell, J.J. Martín-del-Río, M. Solís, J.D. Rodríguez-Mariscal, V. Flores-Alés, F. Pontiga (2025) Evaluation of the physical and mechanical behaviour of rammed earth by incorporation of recycled glass, *Boletín de la Sociedad Española de Cerámica y Vidrio* **64**:100442. Doi: 10.1016/j.bsecv.2025.100442
3. H. Moreno, F. Pontiga, J.M. Valverde (2021) Low concentration  $CO_2$  capture in fluidized beds of  $Ca(OH)_2$  as affected by storage humidity, *Chemical Engineering Journal* **407**:127179. Doi: 10.1016/j.cej.2020.127179



4. M.R. Bouazza, K. Yanallah, F. Pontiga and J.H. Chen (2018) A simplified formulation of wire-plate corona discharge in air: Application to the ion wind simulation, *Journal of Electrostatics* **92**:54–65. Doi: 10.1016/j.elstat.2012.05.002
5. M. Moss, K. Yanallah, R.W.K. Allen and F. Pontiga (2017) An investigation of CO<sub>2</sub> splitting using nanosecond pulsed corona discharge: effect of argon addition on Ca(OH)<sub>2</sub> conversion and energy efficiency, *Plasma Sources Science and Technology* **26**:035009. Doi: 10.1088/1361-6595/aa5b1d
6. F.J. Durán-Olivencia, F. Pontiga and A. Castellanos (2014) Multi-species simulation of Trichel pulses in oxygen, *Journal of Physics D: Applied Physics* **47**(41):415203. Doi: 10.1088/0022-3727/47/41/415203
7. F. Pontiga, J.M. Valverde, H. Moreno and F.J. Duran-Olivencia (2013) Dry gas-solid carbonation in fluidized beds of Ca(OH)<sub>2</sub> and nanosilica/Ca(OH)<sub>2</sub> at ambient temperature and low Ca(OH)<sub>2</sub> pressure, *Chemical Engineering Journal* **222**:546-552. Doi: 10.1016/j.cej.2013.02.067
8. J. M. Valverde, F.J. Duran, F. Pontiga, H. Moreno (2012) CO<sub>2</sub> capture enhancement in a fluidized bed of a modified Geldart C powder. *Powder Technology*, **224**:247-252. Doi: 10.1016/j.powtec.2012.02.060
9. K. Yanallah and F. Pontiga (2012) A semi-analytical stationary model of a point-to-plane corona discharge, *Plasma Sources Science and Technology*, **21**(4):045007. Doi: 10.1088/0963-0252/21/4/045007
10. J. M. Valverde, F. Pontiga, C. Soria-Hoyo, M.A.S. Quintanilla, H. Moreno, F. J. Duran and M. J. Espin (2011) Improving the gas–solids contact efficiency in a fluidized bed of Ca(OH)<sub>2</sub> adsorbent fine particles, *Physical Chemistry Chemical Physics*, **13**:14906–14909. Doi: 10.1039/c1cp21939a

**C.2. Congress**, indicating the modality of their participation (invited conference, oral presentation, poster)

1. K. Yanallah, M.R. Bouazza, A. Tilmatine, F. Pontiga, A. Zouaghi, N. Kadous, and Y. Bellebna. Numerical Modeling of Dust Particle Motion in a Corona Discharge-Based Ionic Wind Cleaning System for Solar Panels. *International Symposium on Electrohydrodynamics 2025*, Sevilla (Spain) June 10-13, 2025.
2. Oral - F. Pontiga, H. Moreno, C. Soria-Hoyo, F.J. Durán-Olivencia, M.A. Martín-Alfonso, and J.M. Valverde. Electrostatic removal of CaCO<sub>3</sub> particles using dielectric barrier discharge. *11th International Conference on Conveying and Handling of Particulate Solids (CHoPS 2024)*, Edinburgh (UK) September 2-4, 2024.
3. Oral - M.R. Bouazza, M. Bouadi, A. Chelih, K. Yanallah, F. Pontiga, P. Vázquez. Effect of the EHD force on the spatial distribution of neutral species generated by a positive and negative corona discharge. *IEEE International Conference on Dielectric Liquids*, Sevilla (Spain) May 29-June 2, 2022.
4. Poster - F. J. Durán-Olivencia and F. Pontiga, 2D numerical modelling of Trichel pulses in oxygen, in *47th European Physical Society Plasma Physics Conference*, Virtual Conference, June 21-25, 2021.
5. Invited conference - H. Moreno, F. Pontiga, and J.M. Valverde, Carbon dioxide capture in fluidized beds of nanosilica/Ca(OH)<sub>2</sub>, in *International Conference on Renewable Energy and Energy Conversion*, Oran (Algeria) November 11-13, 2019.
6. Oral - F. Pontiga, M. Guemou. H. Moreno, A. Fernández-Rueda and K. Yanallah, Carbon Dioxide Dissociation Using Pulsed DBD with Different Kinds of Dielectric Barriers, in *International Conference on Renewable Energy and Energy Conversion*, Oran (Algeria) November 11-13, 2019.
7. Poster - F. Pontiga, A. Fernández-Rueda, H. Moreno, K. Yanallah, M.S. Moss and R.W.K. Allen, Comparison between AC DBD and nanosecond pulsed DBD for carbon dioxide dissociation with mixtures of oxygen, in *Europhysics Conference on the Atomic and Molecular Physics of Ionized Gases*, Glasgow (UK) July 17-21, 2018.
8. Oral - M.S. Moss, K. Yanallah, R.W.K. Allen, and F. Pontiga, Carbon dioxide splitting using nanosecond pulsed corona discharge, in *XLV International Conference "Advanced Problems in Mechanics"*, St. Petersburg (Russia) June 22-27, 2017.



9. Poster - F. Pontiga, K. Hadji, M. Guemou and H. Moreno, Experimental study of dielectric barrier discharge in mixtures of carbon dioxide and oxygen, in *15th High Pressure Low Temperature Plasma Chemistry Symposium*, Brno (Czech Republic) September 11-16, 2016.
10. Invited conference - F. Pontiga, F. J. Durán-Olivencia and A. Castellanos, Plasma chemistry simulation of Trichel pulses in oxygen, *International Conference on Plasma and Materials*, Tlemcen (Algeria) November 15-17, 2014.

**C.3. Research projects**, indicating your personal contribution. In the case of young researchers, indicate lines of research for which they have been responsible.

1. PID2022-138943OB-I00: Micromecanica, Obstrucciones y Flujos Granulares en Sistemas de Almacenamiento Termoquímico. Ministerio de Ciencia e Innovación. PI: F. Pontiga and F.J. Durán (Universidad de Sevilla). 2023-2026. 150000 EUR. Type of participation: principal investigator.
2. TED2021-132676A-I00: *Rheology of Cohesive Granular Media in Thermochemical Storage Systems*. Ministerio de Ciencia e Innovación. PI: F.J. Durán (Universidad Loyola Andalucía). 2022-2023. 87860 EUR. Type of participation: researcher.
3. PGC2018-099217-B-I00. *Physicochemical Fluid-Dynamics with Electric Fields applied to Key Enabling Technologies and the Environment*. Ministerio de Ciencia, Innovación y Universidades. PI: A. Ramos and F. Pontiga (Universidad de Sevilla). 2019-2021. 54450 EUR. Type of participation: principal investigator.
4. FIS2014-54539-P: *Influence of mechanical, electric and/or magnetic forces on the behaviour of liquids, gases and cohesive granular media*. Ministerio de Economía y Competitividad. PI: A. Ramos and F. Pontiga (Universidad de Sevilla). 2015-2018. 141570 EUR. Type of participation: principal investigator.
5. FIS2011-25161: *Dynamics of fluids, suspensions and cohesive granular media subject to mechanical, electric and/or magnetic forces*. Ministerio de Ciencia e Innovación. PI: A. Castellanos. 2012-2015. 329120 EUR. Type of participation: researcher.
6. AP/042199/11: *Cold Plasma Production by Electrical Discharges and its Application to Polymer Processing*. Ministerio de Asuntos Exteriores y Cooperación. PI: F. Pontiga (Universidad de Sevilla). 2011-2013. 6000 EUR. Type of participation: principal investigator.
7. P09-FQM-4983: *Corona Discharge in Gases of Atmospheric Interest*. Consejería de Innovación, Ciencia y Empresa, Junta de Andalucía. PI: F. Pontiga (Universidad de Sevilla). 2010-2014. 159169,68 EUR. Type of participation: principal investigator.
8. CM0805: The chemical cosmos: understanding chemistry in astronomical environments. COST Grant System. IP: Nigel Mason (The Open University, UK). 2009-2013. 80 M€ (economic dimension). Type of participation: researcher and Master Committee Substitute Member
9. A/016265/08 and A/023053/09: *Study of the decomposition of carbon dioxide by DC and pulsed corona discharge*. Ministerio de Asuntos Exteriores y Cooperación. IP: F. Pontiga (Universidad de Sevilla). 2009-2011. 30500 EUR. Type of participation: principal investigator.
10. FIS2006-03645: *Electrohydrodynamics of complex fluids and mechanics of cohesive granular media*. Ministerio de Educación y Ciencia. IP: A. Castellanos (Universidad de Sevilla). 2006-2011. 634040 €. Type of participation: researcher.