

CURRICULUM VITAE ABREVIADO (CVA)

Part A. PERSONAL INFORMATION *

First name	Salvador		
Family name	Dueñas Carazo		
Gender (*)	Male	Birth date (dd/mm/yyyy)	
Social Security, Passport, ID number			
e-mail		URL Web	
Open Researcher and Contributor ID (ORCID) (*)	0000-0002-2328-1752		

(*) *Mandatory*

A.1. Current position

Position	Full professor		
Initial date	2010		
Institution	University of Valladolid		
Department/Center	Electricidad y Electrónica	Facultad de Ciencias	
Country	Spain	Teleph. number	+34 83 423679
Key words	Memristors – RRAMs - Electrical characterization – High-k dielectrics		

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

Period	Position/Institution/Country/Interruption cause
1991 – 2010	Profesor Titular de Universidad / Univ. Valladolid
1990 – 1991	Profesor Titular de Universidad Interino / Univ. Valladolid
1986 – 1990	Profesor Titular E.U. Interino / Univ. Valladolid
1984 – 1986	Profesor Ayudante de Universidad / Univ. Valladolid

A.3. Education

PhD, Licensed, Graduate	University/Country	Year
PhD on Physics	University of Valladolid	1989
Licensed on Physics	University of Valladolid	1984

(Include all the necessary rows)

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

Graduate in Physical Sciences (Electronics) with honours, and Doctor of Physical Sciences, with honours, from the University of Valladolid. Full Professor at the University of Valladolid since 2010, in the Department of Electricity and Electronics (Area: Electronics). 6 six-year-research periods recognized (date of the last one: 2023).

Since the very beginning my research career has been devoted to the electrical characterization of structures and materials in the electronic devices field. I am the director of the recognized research group (GIR) on *Electrical Characterization of Materials and Electronic Devices* (GCME) at the University of Valladolid since 2018. I am also a member of the *Consolidated Research Unit* number 51 of Castilla y León (UIC 051). The main objective of our research group is the adaptation and fine-tuning to particular structures of a set of standard techniques based on the analysis of conduction mechanisms and electrical parameters. In addition, we have developed and extensively used original techniques and new variants of these standard techniques that are more precise and appropriate in certain circumstances. Among the original techniques we can mention Optical Admittance Spectroscopy (OAS), Deep Level Spectroscopy at Constant Capacitance (CC-DLOS), Capacitance-Voltage Transient Technique (CVTT), Conductance Transient Technique (G-t), Radio-Frequency Impedance Analysis, and the Flat Band Voltage Transient Technique. With these techniques we have approached the study of new materials and manufacturing processes in electronic technology.

In particular, my scientific interest has focused on the study of high permittivity dielectrics, line of research that I began after a one-year stay at Bell Laboratories (NJ, USA), where I worked on Ta₂O₅ anodization techniques and participated in two patents. My research on these materials has advanced in two fronts: on the one hand, in the search for an alternative material to silicon dioxide as a gate insulator for integrated circuit transistors; in recent years, very specifically in the development of applications in the field of memories based on the resistive switching and ferroelectricity phenomena. We have developed a method to obtain the Memory Maps of Small Signal Parameters. On the other hand, the Double-Swing Quiescent Current Technique allows to detect ferroelectric behavior in very leaky dielectric films.

As our research efforts are mainly focused on the electrical characterization field, in order to obtain a global vision it is essential to maintain solid collaborations with groups devoted to the sample manufacturing as well as to the simulation, modelling and application of the different materials, technological processes and phenomena that capture our interest. In these lines of research, we collaborate on a stable and continuous basis with groups from the Universities of Tartu (Estonia), and Helsinki (Finland) and the Leibniz Institute for High Performance Microelectronics (Germany). On the national scene, we maintain a number of collaborations, among which we highlight the following strong ties: Instituto de Microelectrónica de Barcelona, Universidad Autónoma de Barcelona, Universidad de Granada, Universidad de Las Islas Baleares, and Universidad Complutense. In this sense, the scientific network with which we work in coordination with other national and international groups on a continuous basis constitutes an appropriate interdisciplinary structure to achieve relevant results and contribute to the advancement of scientific knowledge.

A large number of publications in journals, conferences and book chapters, as well as the direction of five PhDs, along with a significant number of student final projects related to my lines of research, support my scientific work. I have extensive experience in research and innovation management, having been the manager of the TEC programme of the Spanish Ministry and director of the Valladolid Science Park. In addition, I am or have been an expert evaluator in competitive calls of the Spanish Ministry in the areas of research projects, and I collaborate with international *research agencies* as a project evaluator. I am also an evaluator or editor of JCR scientific journals.

Part C. RELEVANT MERITS

C.1. Publications

1. H. García, G. Vinuesa, M. B. González, F. Campabadal, H. Castán, and **S. Dueñas**. “Reset transition in HfO₂-based memristors using a constant power signal”. *Materials Science in Semiconductor Processing* **2025**, Vol.186, p. 109037.
2. G. Vinuesa, H. García, M. B. González, F. Campabadal, H. Castán, and **S. Dueñas**. “Dynamics of set and reset processes in HfO₂ switching devices”. *Microelectronic Engineering* **2025**, Vol.296, p. 1112281.
3. G. Vinuesa, T. del Val, K. Kalam, H. García, M. B. González, F. Campabadal, **S. Dueñas** and H. Castán. “Effects of set and reset dynamics on HfO₂, Al₂O₃, and bilayer memristors”. *Solid-State Electronics* **2025**, Vol.230, p. 109262.
4. K. Kalam, R. Rammula, J. Kozlova, T. Käämbre, P. Ritslaid, A. Kasikov, A. Tamm, J. Link, R. Stern, G. Vinuesa, **S. Dueñas**, H. Castán and K. Kukli. “Electrical and magnetic properties of atomic layer deposited cobalt oxide and iron oxide stacks”. *Journal of Materials Chemistry C* **2025**, Vol. 13, p.17551.
5. G. Vinuesa, H. García, S. Poblador, M. B. González, F. Campabadal, H. Castán, and **S. Dueñas**. “Impact of the temperature on the conductive filament morphology in HfO₂-based RRAM”. *Materials Letters* **2024**, Vol.357, p. 135699.
6. E. Pérez-Bosch Quesada, A. Mistrioni, R. Jia, K.D. Swamy Reddy, F. Reichmann, H. Castán, **S. Dueñas**, C. Wenger, and E. Pérez. “Forming and resistive switching of HfO₂-based RRAM devices at cryogenic temperature”. *IEEE Electron Device Letters* **2024**, Vol. 45, p. 2391.

7. D. Maldonado, G. Vinuesa, S. Aldana, F. L. Aguirre, A. Cantudo, H. García, M. B. González, F. Jiménez-Molinos, F. Campabadal, E. Miranda, **S. Dueñas**, H. Castán and J.B. Roldán. "A thorough investigation of the switching dynamics of TiN/Ti/10 nm-HfO₂/W resistive memories". *Materials Science in Semiconductor Processing* **2024**, Vol.169, p. 107878.
8. H. García, G. Vinuesa, E. García-Ochoa, F. L. Aguirre, M. B. González, F. Jiménez-Molinos, F. Campabadal, J. B. Roldán, E. Miranda, **S. Dueñas**, and H. Castán. "Effects of the voltage ramp rate on the conduction characteristics of HfO₂-based resistive switching devices". *Journal of Physics D: Applied Physics* **2023**, Vol. 56 (36), p. 365108.
9. G. Vinuesa, H. García, J.M. Lendínez, E. García-Ochoa, M.B. González, D. Maldonado, C. Aguilera-Pedregosa, E. Moreno, F. Jiménez-Molinos, J.B. Roldán, F. Campabadal, H. Castán, and **S. Dueñas**, "Variability and power enhancement of current controlled resistive switching devices". *Microelectronics Engineering* **2023**, Vol. 276, p. 112008.
10. F. Jiménez-Molinos, G. Vinuesa, H. García, A. Tarre, A. Tamm, K. Kalam, K. Kukli, **S. Dueñas**, H. Castán, M. B. González, F. Campabadal, and J. B. Roldán. "Thermal effects on TiN/Ti/HfO₂/Pt memristors charge conduction". *Journal of Applied Physics* **2022**, Vol. 132, p. 194501.

C.2. Congress

1. **S. Dueñas**, G. Vinuesa, H. García, T. del Val, K. Kalam, M. B. González, F. Campabadal, and H. Castán. "Analysis of the dynamic behavior of memristors by recording current transients". 8th International Conference on Memristive Materials, Devices & Systems (MEMRISYS). 13-16 October **2025**. Poster. Edinburgh (U.K.).
2. G. Vinuesa, T. del Val, K. Kalam, H. García, M. B. González, F. Campabadal, H. Castán, and **S. Dueñas**. "Impact of dielectric thickness on Pt/Ag/HfO₂/W memristors". 8th International Conference on Memristive Materials, Devices & Systems (MEMRISYS). 13-16 October **2025**. Poster. Edinburgh (U.K.).
3. E. Pérez-Bosch Quesada, A. Mistrioni, R. Jia, K.D. Swamy Reddy, M. Fritscher, F. Reichmann, H. Castán, **S. Dueñas**, C. Wenger, and E. Pérez. "Cryogenic Characterization of HfO₂-Based RRAM: Exploring Multilevel Switching from 300 K to 1.5 K for Neuromorphic Quantum Computing". International Conference on Solid State Devices and materials (SSDM). 15-18 September **2025**. Poster. Yokohama (Japan).
4. G. Vinuesa, T. del Val, K. Kalam, H. García, M. B. González, F. Campabadal, H. Castán, and **S. Dueñas**. "Effect of Set and Reset Dynamics on HfO₂, Al₂O₃ and bilayer memristors". 24th Conference on Insulating Films on Semiconductors (INFOS). 25-27 June **2025**. Oral presentation. Granada (Spain).
5. H. García, G. Vinuesa, T. del Val, K. Kalam, M. B. González, F. Campabadal, **S. Dueñas**, and H. Castán. "Multilevel capability of HfO₂ and Al₂O₃-based memristors". 24th Conference on Insulating Films on Semiconductors (INFOS). 25-27 June 2025. Poster. Granada (Spain).
6. G. Vinuesa, H. García, **S. Dueñas**, and H. Castán. "Thermoelectric Analysis of Dielectric Materials Properties for Neuromorphic Technologies". 245th the Electrochemical Society (ECS) Meeting. 26-30 May **2024**. Invited talk. San Francisco (CA, EEUU).
7. G. Vinuesa, H. García, **S. Dueñas**, and H. Castán. I. Íñiguez-de-la-Torre, T. González, K. Dorai Swamy Reddy, M. Uhlmann, C. Wenger, and E. Pérez (2024). "Effect of the Temperature on the Performance and Dynamic Behavior of HfO₂-based RRAM Devices". 245th the Electrochemical Society (ECS) Meeting. 26-30 May **2024**. Poster. San Francisco (CA, EEUU).
8. M. M. Al Chawa, C. de Benito, H. Castán, **S. Duenas**, S. Stavrinides, R. Tetzlaff, and R. Picos (2022). "Empirical modelling of ReRAM measured characteristics using charge and flux". 2022 International Conference on Modern Circuits and Systems technologies (MOCASST) on Electronic and Communications. 8-10 June **2022**. Oral presentation. Bremen (Germany).
9. K. Kalam, M. Otsus, R. Rammula, R. Stern, G. Vinuesa, **S. Duenas**, H. Castán, K. Kukli, and A. Tamm. "Magnetic and electric properties of atomic layer deposited HfO₂-Fe₂O₃ thin films". 22nd International Conference on Atomic Layer Deposition (ALD). 26-29 June **2022**. Oral presentation. Ghent (Belgium).

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.Ref: PID2022-139586NB-C43

“Caracterización eléctrica avanzada de dispositivos memristivos”. Project leaders: Helena Castán Lanaspá and Salvador Dueñas (Universidad de Valladolid). Funding entity: Ministerio de Ciencia, Innovación y Universidades. Dates: 01/09/2023 to 31/08/2026. Total funding: 145000 €. Role: **Research leader**.

2.Ref: TEC2017-84321-C4-2-R

“Fabrication, characterization, Simulation, modeling and applications of resistive switching devices”. Project leaders: Helena Castán Lanaspá and Salvador Dueñas (Universidad de Valladolid). Funding entity: Ministerio de Economía y Competitividad. Dates: 01/01/2018 to 30/09/2021. Total funding: 103000 €. Role: **Research leader**.

3.Ref: TEC2014-52152-C3-3-R

“Electrical characterization of MIS and MIM structures based on high-k dielectrics for RRAMS y memristors application”. Project leader: Helena Castán Lanaspá (Universidad de Valladolid). Funding entity: Ministerio de Economía y Competitividad. Dates: 01/01/2015 to 31/12/2018. Total funding: 101400 €. Role: **Researcher**.

4. Ref: TEC2011-27292-C02-01.

“Fabrication and characterization of high permittivity dielectric films deposited by ALD on silicon and graphene”. Project leader: Helena Castán Lanaspá (Universidad de Valladolid). Funding entity: Ministerio de Ciencia e Innovación. Dates: 01/01/2012 to 31/12/2014. Total funding: 86400 €. Role: **Researcher**.

5. Ref: VA128A11-2.

“Qualification of multicrystalline silicon substrates for solar cells”. Project leader: Helena Castán Lanaspá (Universidad de Valladolid). Funding entity: Consejería de Educación de la Junta de Castilla y León. Dates: 21/03/2011 to 31/12/2013. Total funding: 29900 €. Role: **Researcher**.

C.4. Contracts, technological or transfer merits

1. Salvador Dueñas; Cipriano Bote Mateo. “Sistema de Energía Solar”. Spain. 2011. Universidad de Valladolid.
2. P.A.Sullivan; R.R.Kola; Salvador Dueñas. “Anodized Ta₂O₅ MOS gate dielectric”. USA. 1998. Lucent Technologies, Bell Laboratories.
3. Salvador Dueñas; R.R.Kola; H.Kumagai; M.Y.Lau; P.A.Sullivan and K.Tai. “Process for fabricating a thin film capacitor”. USA. 1998. Lucent Technologies, Bell Laboratories.