Curriculum vitae and Track Record

Carlos Morales Sánchez

Date of birth:
15 January 1992
Nationality:
Spanish

ResearchGate:
Publication profiles:

Carlos-Morales-profile
Google Scholar Citations
ORCID 0000-0001-5890-1950
ScopusID 57202404702

EDUCATION AND PROFESSIONAL QUALIFICATIONS

2019 PhD in Advanced Materials and Nanotechnology

Growth, characterization, and applications of metal oxides on graphitic systems

Faculty of Science, Department of Applied Physics, Autonomous University of Madrid (UAM), Spain

PhD Supervisor: Prof. Leonardo Soriano de Arpe

2015 Master in Energy Sources and Fuels for the Future

M.Sc. Thesis: *Design and construction of a thermal conductivity measurement device based on the analogies between heat fluxes and current intensities;* Faculty of Science, Department of Materials Physics, UAM, Spain

2014 Bachelor in Physics

B.Sc. Thesis: *Synthesis and characterization of TiS_3 thin films with Zr and Pd: formation mechanism and thermo- and photo-electrical properties;* Faculty of Science, Department of Materials Physics, UAM, Spain

CURRENT AND PREVIOUS POSITIONS

2024 - present ***Research associate (Germany)***

Faculty 1 (Mathematics, Computer Science, Physics, Electrical Engineering and Information Technology), Institute of Physics, Prof. Jan Ingo Flege's group of Applied Physics and Semiconductor Spectroscopy (APH), Brandenburg University of Technology (BTU), Germany

Researcher of II-Phase iCampus project

2022 - 2023 ***Research associate (Germany)***

Faculty 1, Institute of Physics, APH-BTU, Germany

Individual Grant, Postdoc Network of Brandenburg (PNB)

2019 – 2021 ***Research associate (Germany)***

Faculty 1, Institute of Physics, APH-BTU, Germany

Researcher of I-Phase iCampus project

2015 - 2019 ***PhD student (Spain)***

Faculty of Science, Department of Applied Physics, Autonomous University of Madrid (UAM)

PhD competitive fellowship (FPU), Spanish Ministry of Education, Culture and Sports, Spain

2018 (6 months) ***Visiting researcher (United States)***

Prof. M. Salmeron, Material Science Division, Lawrence National Berkeley Laboratory, USA

RESEARCH ACHIEVEMENTS AND PEER RECOGNITION

Research line: My work focuses on **Surface Science** and **Applied Physics**, spanning from model to realistic systems in heterogeneous catalysis, energy conversion, and gas sensing. During my predoctoral stage (UAM, Spain), this included the first attempt to create ultrathin metal oxide membranes for *operando* characterization at high pressures at LBL (Berkeley, USA). During my postdoctoral stage (BTU, Germany), **I have led the ALD-XPS branch of the BTU-APH group**, with

particular focus on the development of sensors based on reducible oxides and complex interfaces. This work is extensively complemented by the study of model catalysts, and thin films related to energy conversion and H_2 sensing.

International user facilities: **I have international experience as user of synchrotron facilities**, having participated (i.e., submission of proposal and experiment execution, including leading role of the experimental team) in 29 beamtimes carried out at **ALBA** (Spain), **ELETTRA** (Italy), **BESSY II** (Germany), **MAX IV** (Sweden), **ESRF** (France), **ALS** (USA), and **SSRL** (USA). My expertise encompasses a range of chemical and structural characterization techniques, including XPS, NAP-XPS, XPEEM, XANES, and LEEM. In 2017, I attended the **European HERCULES course on Large Experimental Systems**. I have also conducted experiments at the CERIC-ERIC laboratory network (Czech Republic) and the Molecular Foundry (USA, 3 months, 2018). Furthermore, I led two on-site experiments at the **Institute for Transuranium Elements of the European Commission** (Germany) in 2024 and 2025, each lasting 1 month.

Publications and work dissemination: To date, my work has resulted in the (co-)authorship of **34 peer-reviewed publications**, 19 as first author and 3 as corresponding author. I have participated in over 20 international conferences and workshops, including 12 oral presentations. In July 2025, **I presented an invited talk at the 107th workshop IUVSTA-ZCAM UNIZAR** (Spain).

Funding opportunities and projects: During my predoctoral stage, I was granted a competitive FPU fellowship. In 2022, I was awarded 2 years of funding for a young researcher individual project (**126.128,26 €**) by the PNB (Brandenburg, Germany). As a working team member, I have intensively participated in the preparation, submission, and execution of German projects, taking responsibility for the on-site ALD-XPS lab upgrade (ERDF-EU) and the development of ALD-based active sensing films (iCampus). Work member of two Spanish projects with international collaborators.

- **Social impact:**

Technology transfer: My research activity has also resulted in the **co-invention of two patents** (one Spanish and one American). At BTU, I have played a key role in collaboration with our industrial partner, **SENTECH Instruments GmbH**, which resulted in a peer-reviewed publication in which I am the first and corresponding author. I had an invited talk at SENTECHS's Thin Film Metrology Seminar and Workshop in 2024.

PhD-level teaching and training: Currently, **I am co-supervising a total of 4 PhD theses**, (a) x3 at BTU with Prof. Flege (defense expected 2026 (x2) and 2028 (x1)), and (b) x1 at UAM with Prof. Ares (defense expected 2026). Projects focus on (i) inverse model catalysts of Sm-doped ceria for CO_2 conversion, (ii) ALD-based ultrathin active layers for H_2-sensig (x2); (iii) role of Pd as catalyst for fast Mg hydrogenation. At BTU, I have also supervised 3 Master's theses (2 defended) and 3 Bachelor's theses (all defended), mentoring students in surface characterization techniques (XPS) and growth of ultrathin deposits (ALD).

I count a total of 510 hours of teaching at BTU and UAM (including 60 hours in the current Winter Semester, 2025/26). At BTU, the teaching activities include advanced courses at the MSc in Physics: *Physics of Surfaces and 2D Materials* and *Nanocatalysis* (4h/week each, 2024–present), as well as the seminar of *Scientific Writing in English* (2h/week, 2020–2023) at the BSc in Physics. At UAM (2015-2019), I completed 180 hours of laboratory practice supervision.

Peer review activities: Reviewer of the following journals: *Nanoscale, Sens. Actuators B Chem., ACS Appl. Mater. Interfaces, J. Alloys Compd.,* and *Thin Solid Films*.

Science popularization: participation at BTU in different activities to bring society and research closer (e.g., "*Nacht der kreativen Köpfe*", 2025).

- **Peer recognition**

Credential "Ayudante doctor" (2020) – *ANECA (Spain)*

PhD Thesis First Prize (2022) – *Spanish Association of Synchrotron Users (AUSE)*

First Poster Prize (2022) – Ambient Pressure XPS Workshop

Front Covers (2025): (i) *ChemSusChem*, **2025**, (ii) *Adv. Mater. Interfaces*, **2025**

SELECTED PUBLICATIONS

Peer-reviewed publications (34)
Selected publications over the last 3 years

2025 **C. Morales,** R. Tschammer, E. Pożarowska, I. J. Villar-Garcia, V. Pérez-Dieste, M. Favaro, D. E. Starr, C. Alvarado, C. Wenger, K. Henkel, J. I. Flege; "Hydrogen Sensing via Heterolytic H_2 Activation at Room Temperature by Atomic Layer Deposited Ceria". *ChemSusChem;* DOI: 10.1002/cssc.202402342; ***Selected for Front Cover in ChemSusChem***

2025 **C. Morales,** M. Gertig, M. Kot, C. Alvarado, M. A. Schubert, M. H. Zoellner, C. Wenger, K. Henkel, J.I. Flege; "In situ X-ray photoelectron spectroscopy study of atomic layer deposited cerium oxide on SiO_2: substrate influence on the reaction mechanism during the early stages of growth". *Adv. Mater. Interfaces* 2025,12, 5, 2400537; DOI: 10.1002/admi.202400537; ***Selected for Front Cover in Adv. Mater. Interfaces***

2025 **C. Morales**, R. Tschammer, T. Gouder, Y.M. Choi, D. Anjum, A. Baunthiyal, J.-O. Krisponeit, Jens Falta, J. I. Flege, H. Idriss "Stabilization of Ce^{3+} cations via U-Ce charge transfer in mixed oxides: consequences on the thermochemical water splitting to hydrogen". *J. Phys. Energy*, 2025, 7, 2, 025012; DOI: 10.1088/2515-7655/adbad9

2025 E. Pożarowska, L. Pleines, M. J. Prieto, L. C. Tănase, L. de Souza Caldas, Aarti Tiwari, T. Schmidt, J. Falta, **C. Morales**, Jan Ingo Flege "Relationship between Sm alloying and structure sensitivity of ceria (111)- and (100)-oriented nanoislands on Cu (111)". *Phys. Chem. Chem. Phys, 2025, 27, 15691–15703 DOI: 10.1039/d5cp01171j*

2025 **C. Morales***, A. Pascual, D. Leinen, G. Luna-López, J. R. Ares, J. I. Flege, L. Soriano, I. J. Ferrer, C. Sanchez "Reaction mechanism and kinetic model of the transformation of iron monosulfide thin films into pyrite films". *J. Phys. Chem. C* 2025, 129, 9, 4724–4737; DOI: 10.1021/acs.jpcc.4c08227

2025 R. Tschammer, L. Buß, E. Pozarowska**, C. Morales**, S. Senanayake, M. Prieto, L.Tănase, Liviu, L. de Souza Caldas, A. Tiwari, T. Schmidt, M. Nino, M.Foerster, J. Falta, J. I. Flege "High-temperature growth of CeO_x on Au(111) and behavior under reducing and oxidizing conditions". *J. Phys. Chem. C* 2025, 129, 7, 3583–3594; DOI: 10.1021/acs.jpcc.4c08072

2024 **C. Morales*,** P. Plate, L. Marth, F. Naumann, M. Kot, C. Janowitz, P. Kus, M. Zoellner, C. Wenger, K. Henkel, J. I. Flege; "Bottom-up design of a super-cycle recipe for atomic layer deposition of tunable indium gallium zinc oxide thin films". *ACS Appl. Electron. Mater*. 2024, 6, 5694−5704; DOI: 10.1021/acsaelm.4c00730

2023 **C. Morales**, A. Mahmoodinezhad, R. Tschammer, J. Kosto, C. Alvarado-Chavarin, M. A. Schubert, C. Wenger, K. Henkel, J. I. Flege; "Combination of Multiple Operando and In-Situ Characterization Techniques in a Single Cluster System for Atomic Layer Deposition: Unraveling the Early Stages of Growth of Ultrathin Al_2O_3 Films on Metallic Ti Substrates. *Inorganics*, 2023, 11, 477. DOI: 10.3390/inorganics11120477

Patents (2)

US 11821081B2; 21/11/2023
Yi-Hsien Lu, Xiao Zhao, Matthijs Van Spronsen, Adam Schwartzberg, Miquel Salmeron, **Carlos Morales**
"Thin free-standing oxide membranes"

ES 2931217B2; 03/01/2024
Carlos Morales, Eduardo Flores, Jose Ramón Ares, Carlos Sánchez, Isabel Jiménez Ferrer
"Dispositivo y generador termoeléctrico" ("Thermoelectric device and generator")