Raquel Sánchez Barquilla

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CURRENT POSITION

03.04.2023 – actual | Postdoc position at the Applied Physics and Semiconductor Spectroscopy group of Prof. Dr. Jan Ingo Flege. Brandenburg Technological University, Germany.

Applied Physics and Semiconductor Spectroscopy *LG1A 211*
Institute of Physics, Faculty 01 *Konrad-Zuse-Str. 1*
Brandenburg University of Technology Cottbus-Senftenberg *D-03046 Cottbus*

EDUCATION

01.07.2017 – 21.03.2023 | PhD Student in Condensed Matter Physics, Nanoscience and Biophysics, titled *Atomic scale quantization and charging effects in topological materials.*

- 2019 – 2023 FPI fellowship under the project *"Nuevas microscopias de dispositivos para visualizar materiales cuánticos controlados".*
- *2017*– 2019 under the project *"PNICTEYES-Using extreme magnetic field microscopy to visualize correlated electron materials".*

2016 – 2017 | M.Sc. in Condensed Matter Physics and Biological Systems. Specialization in Nanophysics at Universidad Autónoma de Madrid.

2012 – 2016 | B.Sc. in Physics in Universidad Autónoma de Madrid.

EXPERTISE AREAS

- X-ray photoelectron spectroscopy (XPS), low-energy electron microscopy (LEEM), and low-energy electron diffraction (LEED).
- Synchrotron facilities user, materials characterization, and heterogeneous catalysis.
- Very low temperatures, scanning tunneling microscopy (STM), topological materials, superconductivity.

TEACHING EXPERIENCE AT THE UNIVERSITY – ACADEMIC YEARS

2025 – 2026 | Brandenburg University of Technology.

- Winter semester - *Seminar Advanced Seminar Experimental Physics, M.Sc. Physics (Total SWS: 2)*.
- Winter semester - *Nanocatalysis, M.Sc. Physics (Total SWS: 2).*

2024 – 2025 | Brandenburg University of Technology.

- Summer semester - *Seminar Applied Spectroscopy and Microscopy, M.Sc. Physics (Total SWS: 2)*.

- Winter semester - *Angewandte Physik (Materialanalytik), B.Sc. Physics (Total SWS: 4)*.

2023 – 2024 | Brandenburg University of Technology.

- Summer semester - *Writing in English (Schreiben auf Englisch), Seminar Forschungsmodul I, B.Sc. Physics (Total SWS: 2)*.

- Summer semester - *Seminar Applied Spectroscopy and Microscopy, M.Sc. Physics (Total SWS: 2)*.

- Summer semester - *Practical tutorial in the APH-BTU Summer School*.

2022 – 2023 | Brandenburg University of Technology

- Summer semester - *Practical tutorial in the APH-BTU Summer School*.

Ph.D. Theses (in close collaboration with Prof. Jan Ingo Flege)

- **Bjorn Riedel** (Brandenburg University of Technology, BTU), 2025-current. "*In situ studies of mixed cerium oxide-based inverse model catalysts*". Estimated defense in 2028.

M.Sc. Theses (in close collaboration with Prof. Jan Ingo Flege)

- **Alexander Schreider** (Brandenburg University of Technology, BTU), "*Phase diagram of Sm_2O_3/Cu(111)*". Estimated defense in June 2026.

- **Cathy Sulaiman** (Brandenburg University of Technology, BTU), "*$TaTe_2$ and $TaSe_2$ islands grown on Au(111)*". Defended on February 16th, 2026.

- **Bjorn Riedel** (Brandenburg University of Technology, BTU), "*Heteroepitaxial growth of samarium oxide nanoislands on Cu(111)*". Defended on April 30th, 2025.

- **Dominic Guttmann** (Brandenburg University of Technology, BTU) "*Oxide formation and oxide/metal interaction in CeO_x/Ni(111)*". Defended on December 10th, 2024.

B.Sc. Theses (in close collaboration with Prof. Jan Ingo Flege)

- **Lotta Marie Müller** (Brandenburg University of Technology, BTU), "*Growth and stability of CeO_2(100) islands on Cu(111)*". Estimated defense on April 2026.

- **Maja Atlas** (Brandenburg University of Technology, BTU), "*Pressure vs temperature phase diagram of CeO_2 on Cu(111)*". Estimated defense on January 2026.

- **Bjorn Riedel** (Brandenburg University of Technology, BTU), "*Characterization of nickel oxide on Nickel(111) using low energy electron diffraction, x-ray and ultraviolet photoelectron spectroscopy*". Defended on September 27th, 2023.

LARGE FACILITIES EXPERIENCE – EXPERIMENTAL TECHNIQUES: XPS, NAP-XPS AND XPEEM/LEEM

Synchrotrons (6)

2025 ALBA, Cerdanyola del Vallès, Spain, beamline BL16 NOTOS. Probing by XAS the relationship between local structure, electronic properties, and catalytic activity of Ni-based CeO_2 or $CeSmO_x$ catalysts for CO_2 methanation.

2025 BESSY II, Berlin, Germany, beamline SMART. The role of epitaxy and structure sensitivity in the chemistry of Ce-Sm oxides on Cu(111), co-proposer and experimental team leader.

2025 BESSY II, Berlin, Germany, beamline SMART. Unraveling the role of epitaxy and structure sensitivity of Sm-CeO_x (100)-oriented islands on Ru(10-10) for CO_2 hydrogenation, experimental team leader.

2024 BESSY II, Berlin, Germany, beamline SMART. Structural study of Sm2O3 and SmOx metastable phases promoted by CeO_2(111)- and (100)-oriented islands on Cu(111), experimental team leader.

2024 ELETTRA, Trieste, Italy, Nanospectroscopy beamline Catalytic properties of SmOx metastable phases and alloyed SmxCe1-xOy islands on Cu(111). Experimental team leader.

2024 ALBA, Cerdanyola del Vallès, Spain, beamline BL24 CIRCE; The role of samarium for catalytic reduction of cerium oxide on Ru(0001), co-proposer and experimental team leader.

Other international facilities (1)

2024 CERIC-ERIC, NAP-XPS laboratory, Charles University, Prague; Investigating the role of samarium for catalytic reduction of ceria on Cu(111), main proposer.

PUBLICATIONS

***Published* (4)**

2025 Raquel Sánchez-Barquilla, Francisco Martín Vega, Alberto M. Ruiz, Na Hyun Jo, Edwin Herrera, José J. Baldoví, Masayuki Ochi, Ryotaro Arita, Sergey L. Bud'ko, Paul C. Canfield, Isabel Guillamón and Hermann Suderow. ***Electronic band structure from quasiparticle interference and Landau quantization in WTe_2.***

DOI: 10.1103/7xnv-8wvt

2025 Lars Buß, Cathy Sulaiman, Raquel Sánchez-Barquilla, Iulia Cojocariu, Marcin Szpytma, Tevfik Onur Mentes, Andrea Localtelli, Jens Falta and Jan Ingo Flege. ***The rise and fall of 1T-TaS_2: Epitaxial growth of monolayer TaS_2 on Au(111).***

DOI: 10.1103/1bxg-yvw2

2021 Francisco Martín-Vega, Victor Barrena, Raquel Sánchez-Barquilla, Marta Fernández-Lomana, Jose Benito Llorens, Beilun Wu, Antón Fente, David Perconte Duplain, Ignacio Horcas, Raquel Lopez, Javier Blanco, Juan Higuera, Samuel Mañas, Na Huyn Jo, Juan Schmidt, Paul Canfield, Gabino Rubio-Bollinger, Jose Rodrigo, Edwin Herrera, Isabel Guillamón and Hermann Suderow. ***Simplified feedback control system for Scanning Tunneling Microscopy*.**

DOI: 10.1063/5.0064511

2021 Marta Fernández-Lomana, Beilun Wu, Francisco Martín-Vega, Raquel Sánchez-Barquilla, Rafael Álvarez Montoya, Jose María Castilla, Jose Navarrete, Juan Marijuan, Edwin Herrera, Hermann Suderow and Isabel Guillamón. ***Milikelvin scanning tunneling microscope at 20/22 T with a graphite enabled stick-lip approach and an energy resolution below 8 μeV: Application to conductance quantization at 20T in***

single atom point contacts of Al and Au and to the charge density wave of 2H-$NbSe_2$.

DOI: 10.1063/5.0059394

GRANTS AND FELLOSHIPS

2019 – 2023 | PhD fellowship: University Scientific Training (FPI), Spanish Ministry of Education, Culture and Sports.

2014 | INC grant for physics students with the *Study of the generation of High Magnetic Fields.*

POSTERS PRICE

Best poster presentation for STM in the flat band Kagome lattice compound $Co_3Sn_2S_2$. SCES 2020 (2021). 5th September-2th October. Online.

First poster prize for Reducibility of Sm-doped ceria islands on Ru(0001). 107th Workshop IUVSTA-ZCAM-UNIZAR Oxides for Energy Applications: Bridging Experiment and Theory to Understand Functionality. 30th June-4th July. Zaragoza (Spain).

SELECTED CONFERENCE CONTRIBUTIONS

Talk contributions

2025 1st Spanish meeting on Microscopy with Low-Energy Electrons (IBERLEEM). 15th-17th October. Madrid (Spain). Correlating LEEM and NAP-XPS in ceria-based model catalysts for CO_2 activation.

2025 DPG-Frühjahrstagung. 16th-21st March. Regensburg (Germany). *Reducibility of Sm-doped ceria islands on Ru(0001).*

2024 DPG-Frühjahrstagung. 17th-22st March. Berlin (Germany). *The relation between substrate, Sm alloy, and surface sensitivity of ceria (111)- and (100)-oriented nano-islands on Ru(0001) and Cu(111).*

Poster contributions

2025 107th Workshop IUVSTA-ZCAM-UNIZAR Oxides for Energy Applications: Bridging Experiment and Theory to Understand Functionality. 30th June-4th July. Zaragoza (Spain). Reducibility of Sm-doped ceria islands on Ru(0001).

2022 SCES 2022– International Conference on Strongly Correlated Electron Systems. 24th-29th July. Amsterdam (The Netherlands). *Milikelvin STM studies in FeSe*.

2022 XXXVIII Biennial meeting of the Real Sociedad Española de Física. 11th-15th July. Murcia (Spain). *STM at high magnetic fields in the superconducting series $FeSe_{1-x}S_x$*.

2022 **2021** SCES 2020 – International Conference on Strongly Correlated Electron Systems. 5th September-2th October (online). *STM in the flat band Kagome lattice compound $Co_3Sn_2S_2$.*

2021 TopoSuper2021 Emergent Topological Superconductivity. 7th-9th June (online). *Magnetic field dependence of the tunneling density of states in the type-II Weyl semimetal WTe_2.*