MARIE SKŁODOWSKA-CURIE POSTDOCTORAL FELLOWSHIPS 2021

EXPRESSION OF INTEREST FOR HOSTING MARIE CURIE FELLOWS

HOST INSTITUTION

NOVA University Lisbon | School of Science and Technology

RESEARCH GROUP AND URL

CENIMAT/I3N
https://www.cenimat.fct.unl.pt/

SUPERVISOR (NAME AND E-MAIL)

Jonas Deuermeier
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SHORT CV OF THE SUPERVISOR

Jonas Deuermeier holds a joint doctoral degree from the Universidade Nova de Lisboa, Portugal and the Technische Universität Darmstadt, Germany as a result of a collaborative PhD project under co-supervision by Prof. Elvira Fortunato and Prof. Andreas Klein. Currently, he is responsible for X-ray and ultravoilet photoelectron spectroscopy (XPS/UPS) at CENIMAT/I3N. The central theme of his research is the correlation of interface properties with electrical device behavior, with a strong emphasis on oxide semiconductors. Recently, his main output has been the development of novel self-rectifying resistive switching devices, which are controlled by chemical and electronic interactions at interfaces. In an ongoing PhD thesis under his supervision, a simulation framework is developed for the quantitative study of facetted and multilayered micro/nanoparticles by photoelectron spectroscopy. As evidence by his full publication record, he is maintaining a dense network of collaborations on the European level (Germany, France, Norway, Finland).

5 SELECTED PUBLICATIONS

- "Orientation dependence of electrical properties of polycrystalline Cu_2O thin films", M. Tibério, T. Calmeiro, S. Nandy, D. Nunes, R. Martins, E. Fortunato, J. Deuermeier, *Semiconductor Science and Technology* **2020**, *35*, 075016, http://doi.org/10.1088/1361-6641/ab883b.
- "2D Resistive Switching Based on Amorphous Zinc–Tin Oxide Schottky Diodes", N. Casa Branca, J. Deuermeier, J. Martins, E. Carlos, M. Pereira, R. Martins, E. Fortunato, A. Kiazadeh, *Advanced Electronic Materials* **2020**, *6*, 1900958, https://doi.org/10.1002/aelm.201900958.
- "Flexible and transparent ReRAM devices for system on panel (SOP) application", A. Kiazadeh and J. Deuermeier, in *Advances in Non-Volatile Memory and Storage Technology* (Eds.: Y. Nishi, B. Magyari-Kope), Woodhead Publishing, **2019**, pp. 519–538., https://doi.org/10.1016/B978-0-08-102584-0.00014-0.
- "Visualization of nanocrystalline CuO in the grain boundaries of Cu_2O thin films and effect on band bending and film resistivity", J. Deuermeier, H. Liu, L. Rapenne, T. Calmeiro, G. Renou, R. Martins, D. Muñoz-Rojas, E. Fortunato, *APL Materials* **2018**, *6*, 096103, http://doi.org/10.1063/1.5042046.
- "Energy band alignment at the nanoscale", J. Deuermeier, E. Fortunato, R. Martins, A. Klein, *Applied Physics Letters* **2017**, *110*, 051603, http://doi.org/10.1063/1.4975644.

PROJECT TITLE AND SHORT DESCRIPTION

Boosting photocatalytic water splitting activity through facet surface potential engineering

Primary societal challenges include the supply of renewable energy such as hydrogen. Photocatalysis using semiconducting oxide particles and films is currently heavily studied for this purpose. The performance of such photocatalysts is strongly dependent on the exposed crystallographic facet(s) and the best charge separation is typically achieved with multi-facet particles. Accordingly, different facets show different surface band bendings, surface oxidation/reduction after adsorption and surface defect concentrations. These properties are typically studied by X-ray and ultraviolet photoelectron spectroscopy (XPS/UPS), but the technique is not inherently quantitative for non-planar and multi-facet surfaces. A currently ongoing PhD work at CENIMAT/I3N aims at achieving a quantitative understanding of inhomogeneous surface properties by XPS/UPS of typical photocatalysts.

The Post-Doc is expected to complement the surface analysis work with experimental verification of the photocatalytic water splitting activity and, in this way, contribute to the rationale design of innovative photocatalysts. The Post-Doc will help to implement the experimental procedure and his/her experience in this regard is highly valued. The hydrogen and oxygen evolution reactions will be differentiated by the used of hole and electron scavengers, respectively. The gaseous products will be analyzed by quadrupole mass spectrometry.

SCIENTIFIC AREA WHERE THE PROJECT FITS BEST*

Chemistry (CHE)