

# JAN BALAJKA

## CURRICULUM VITAE

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## PROFESSIONAL EXPERIENCE AND EDUCATION

- 2020–            Assistant Professor, Vienna University of Technology, Austria
- 2019–2020    Postdoctoral Associate, Cornell University, Ithaca, NY, USA (advisor: Melissa A. Hines)
- 2018            Ph.D. in physics, TU Wien, Austria (advisor: Ulrike Diebold)

## RESEARCH INTERESTS

*Surface and materials science, physical chemistry, oxide and mineral surfaces, solid-liquid interfaces, scanning probe microscopy, ultrahigh vacuum technology, hydroxides, geochemistry, carbon capture and mineralization*

My research is centered on environmentally-relevant oxide surfaces and their interaction with aqueous media. The experiments span from fundamental studies of surface structure and properties under ultrahigh vacuum to reactions with complex environments of liquids and high pressures of gases. Through the experiments, we strive to understand materials' structure and stability under realistic conditions and unveil the origins of environmental and technological processes at the solid-liquid interface. We use scanning probe microscopy (STM/AFM) to study the atomic structure and chemically sensitive spectroscopic methods (XPS, LEIS) in combination with a custom-built apparatus for dosing pure liquid water under ultrahigh vacuum, to eliminate air-borne impurities and achieve highly controlled conditions.

## AWARDS

- 2019            Loschmidt Prize, Physical Chemistry Society, Austria
- 2013            Dean's Prize, Brno University of Technology, Czech Republic

## SELECTED PUBLICATIONS

1. Jan Balajka, Melissa A. Hines, William J. I. DeBenedetti, Mojmír Komora, Jiří Pavelec, Michael Schmid, Ulrike Diebold  
High affinity adsorption leads to molecularly ordered interfaces on TiO<sub>2</sub> in air and solution  
*Science* 361, 6404, 786–789 (2018), [10.1126/science.aat6752](https://doi.org/10.1126/science.aat6752)
2. Jan Balajka, Jiří Pavelec, Mojmír Komora, Michael Schmid, Ulrike Diebold  
Apparatus for dosing liquid water in ultrahigh vacuum  
*Review of Scientific Instruments* 89, 8, 83906 (2018), [10.1063/1.5046846](https://doi.org/10.1063/1.5046846)
3. Jan Balajka, Ulrich Aschauer, Stijn F. L. Mertens, Annabella Selloni, Michael Schmid, Ulrike Diebold  
Surface structure of TiO<sub>2</sub> rutile (011) exposed to liquid water  
*Journal of Physical Chemistry C* 121, 47, 26424–26431 (2017), [10.1021/acs.jpcc.7b09674](https://doi.org/10.1021/acs.jpcc.7b09674)
4. Giada Franceschi, Ulrike Diebold, Jan Balajka  
Atomic structure of oxide surfaces in aqueous environment (review chapter), edited by David E. Starr and Hendrik Bluhm  
*Encyclopedia of Solid-Liquid Interfaces (First Edition)*, 200-209, Elsevier 2023, (eds. Klaus Wandelt and Gianlorenzo Bussetti) [10.1016/B978-0-323-85669-0.00078-7](https://doi.org/10.1016/B978-0-323-85669-0.00078-7)
5. Florian Kraushofer, Francesca Mirabella, Jian Xu, Jiří Pavelec, Jan Balajka, Matthias Müllner, Nikolaus Resch, Zdeněk Jakub, Jan Hulva, Matthias Meier, Michael Schmid, Ulrike Diebold, Gareth S. Parkinson  
Self-limited growth of an oxyhydroxide phase at the Fe<sub>3</sub>O<sub>4</sub>(001) surface in liquid and ambient pressure water  
*The Journal of Chemical Physics* 151, 154702 (2019), [10.1063/1.5116652](https://doi.org/10.1063/1.5116652)
6. Zdeněk Jakub, Matthias Meier, Florian Kraushofer, Jan Balajka, Jiří Pavelec, Michael Schmid, Cesare Franchini, Ulrike Diebold, Gareth S. Parkinson  
Rapid oxygen exchange between hematite and water vapor  
*Nature Communications* 12, 6488 (2021), [10.1038/s41467-021-26601-4](https://doi.org/10.1038/s41467-021-26601-4)
7. Francesca Mirabella, Jan Balajka, Jiří Pavelec, Markus Göbel, Florian Kraushofer, Michael Schmid, Gareth S. Parkinson, Ulrike Diebold  
Atomic-Scale Studies of Fe<sub>3</sub>O<sub>4</sub>(001) and TiO<sub>2</sub>(110) Surfaces Following Immersion in CO<sub>2</sub>-Acidified Water  
*ChemPhysChem* 21, 16, 1788–1796 (2020), [10.1002/cphc.202000471](https://doi.org/10.1002/cphc.202000471)

## INVITED TALKS

2023/11/15 Invited talk at Operando SPM 2023 - 1st International Conference on Nanoscale Catalysis and Energy Conversion in Berlin, Germany (organized by Christopher S. Kley and Florian Johann)

"Atomic scale insights into oxide surfaces in aqueous environments"

- 2023/11/03 Invited seminar at Pacific Northwest National Laboratory (PNNL), Richland, WA, USA (hosts: Zdenek Dohnalek and Zbynek Novotny)  
*"Atomic Structure of the Reconstructed  $\alpha$ -Al<sub>2</sub>O<sub>3</sub>(0001) Surface Revealed by Chemically Sensitive Noncontact AFM"*
- 2023/07/03 Invited attendee talk at ZCAM Metal-Oxide Ultrathin Films and Nanostructures: Meets Theory in Zaragoza, Spain  
*"The atomic structure of reconstructed Al<sub>2</sub>O<sub>3</sub>(0001) surface"*
- 2023/06/19 Hot topic talk at Cluster Meeting 2023 in Prague, Czech Republic  
*"The atomic structure of reconstructed Al<sub>2</sub>O<sub>3</sub>(0001) surface"*
- 2022/09/01 Invited seminar at Uppsala University, Sweden (host: Chao Zhang)  
*"Atomic Structure of Oxide Surfaces in Aqueous Environment"*

## COMMUNITY SERVICE

- 2023 Reviewer of abstracts for ECOSS-36, in Łódź, Poland, organized by Pawel Kowalczyk
- 2023 Organizer of mini-symposium on Atomic-scale mineral-water interfaces within 36<sup>th</sup> European Conference of Surface Science (ECOSS) in Łódź, Poland, with Johannes Lützenkirchen (KIT) and Chao Zhang (Uppsala University)
- 2023 Reviewer for Deutsche Forschungsgemeinschaft (DFG) funding agency, Germany
- 2022 Committee member of Franz Viehböck Young Investigator Award, Austria
- 2022 Expert referee for Ph.D. stipend applications, Studienstiftung, Germany
- 2021 Co-organizer of 18th IUVESTA Summer School on *Physics at Nanoscale* (hybrid due to Covid-19)
- 2020 Committee member of Franz Viehböck Young Investigator Award, Austria

### Peer reviewer for various journals

*Nature Materials, Nature Communications, JACS, Angewandte Chemie, Acc. Chem. Res, Nano Letters, Chem (Cell), Physical Review Letters, J. Phys. Chem. Letters, J. Phys. Chem. C, Phys. Chem. Chem. Phys., Surface Science, Langmuir, Beilstein Journal of Nanotechnology*

## MENTORING

### Graduate Students

- 2023– David Kugler  
 2021– Johanna Hütner

### Master Students

- 2022 David Kugler (Erasmus Internship)  
2022 Dominik Hruža (Erasmus Internship)

### **Bachelor Students**

- 2023 Milena Zehetner  
2021 Sophie Wrathall

*Co-supervision of several other graduate students and postdocs*

### **TEACHING & SCIENCE OUTREACH**

- 2023 Surface Physics Lecture (substitute for U. Diebold), TU Wien, Austria  
2023 Undergraduate Physics Laboratory Exercises 1, TU Wien, Austria  
2022 Undergraduate Physics Laboratory Exercises 3, TU Wien, Austria  
2021 Undergraduate Physics Laboratory Exercises 2, TU Wien, Austria  
2019 Columbia University, New York, NY, USA

Educational activities within Cornell & Columbia STEM Workshop for elementary and middle-school teachers

- 2019 Harlem Promise Academy, New York, NY, USA

Educational activities within Cornell & Columbia STEM Workshop for 7<sup>th</sup>-grade students

### **PERSONAL BACKGROUND**

Born May 21<sup>st</sup>, 1989, Hustopece, Czech Republic

Citizenship: Czech Republic