Sabine M. Neumayer, PhD – Curriculum Vitae

Research & Development Associate Scientist
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PROFESSIONAL EXPERIENCE

Since July 2021: **Research & Development Associate Scientist**
Functional Atomic Force Microscopy Group, Center for Nanophase Materials Sciences (CNMS), Oak Ridge National Laboratory, TN, USA

→ ***Principal Investigator*** *on materials sciences project aimed at the development of energy-efficient, neuromorphic computer chips*

→ ***Co-Principal Investigator*** *on project in the field of long-term energy storage and carbon capturing*

→ ***CNMS theme science researcher*** *on multiscale dynamics in functional materials*

→ ***Technical contact*** *for scientists conducting user projects at CNMS*

2018-2021: **Postdoctoral Research Associate**, Oak Ridge National Laboratory, TN, USA
→ Mentor: Nina Balke
→ Discovered experimental evidence for an additional crystallographic phase in a polar layered van-der-Waals material. Achieved novel polarization switching between multiple states by leveraging ionic – polar interactions for adaptive, high- density information storage.

2015-2017: **Postdoctoral Researcher**, University College Dublin, Ireland
→ Advisor: Brian J. Rodriguez
→ Set up advanced atomic force microscopy modes, demonstrated the impact of surface chemistry, electric fields and temperature on functional behavior in ferroelectric and relaxor materials for optical applications, energy harvesting and electromechanical sensing.

2012-2015: **Marie Curie Early Stage Researcher**, University College Dublin, Ireland
→ Advisor: Brian J. Rodriguez, PhD thesis on "Interface Modulated Charge Transport and Ferroelectric Switching in Lithium Niobate"
→ Achieved control of functional response in ferroelectric crystals through tailored conditions at internal and external interfaces for microscale polarization patterning in optical devices.

EDUCATION

2016 **PhD Physics**, University College Dublin, Ireland

2011 **MSc Technical Physics**, Graz University of Technology, Austria

2008 **BSc Technical Physics**, Graz University of Technology, Austria

HONORS AND AWARDS

- **2023** ORNL Early Career LDRD funding awardee for project on neuromorphic hardware elements
- **2020** CNMS Division Award Distinguished Scientific Paper, "Tunable Quadruple-Well van der Waals Crystals", Nature Materials 19, 43 (2020)
- **2020** People's Choice Award, Your Science in a Nutshell Competition, Oak Ridge National Laboratory
- **2020** Outstanding Presentation Award, Fundamental Physics of Ferroelectrics and Related Materials Workshop
- **2018** Best Presentation Award Gold, Material Research Society Spring Meeting Symposium NM11
- **2018** UCD delegate for Universitas 21 Early Career Researcher workshop "Big Data at the Heart of 21st Century Research", at University of Edinburgh, United Kingdom

PUBLICATIONS

⇒ **54 peer-reviewed publications** in total, **19 first author** publications, **3 book chapters**

⇒ Link to Google Scholar profile, link to ORCID: 0000-0002-8167-1230

⇒ **Citations:** 1157, **h-index:** 19**, i10-index:** 30 (as of 02/29/2024)

⇒ **25 oral presentations** in total, **9 invited**

⇒ **Main contributions:**

- *Developed a protocol for neuromorphic characterization using scanning microwave impedance microscopy and found enhanced electrical memory effects in stacks of 2D layered $PdSe_2$ nanosheets for potential applications in energy-efficient neuromorphic hardware elements.*
- *Achieved dynamic stabilization of metastable states in a triple energy-well ferroelectric crystal through a gradual process of applying electric fields. These findings provide a path to tunable electronic elements for beyond binary high-density computing devices and neuromorphic circuits.*
- *Found experimental evidence for an additional crystallographic phase that is co-existing with the known main phase in a layered van der Waals material. Demonstrated how to use electric fields and the coupling of ionic and polar effects to switch electric polarization between multiple states in unusual ways that are impossible in other types of this material class in follow-on publications. These insights facilitate adaptive high-density information storage.*
- *Discovered how to leverage internal and external interfaces in ferroelectric and semiconducting materials to tailor the functional material response on the micro- and nanoscale for optical and microelectronic devices.*
- *Contributed 20 (including 7 first author, 3 book chapters, 1 tutorial, 1 review article) peer-reviewed publications that highlight important technical aspects of advanced electrical scanning probe microscopy, such as measurement techniques, calibration, signal processing including machine learning, as well as data interpretation. These publications advance the field of functional atomic force microscopy and functional materials sciences.*