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Scientific Work Experience

Technical University of Denmark (DTU) *Lyngby, Denmark*
Postdoctoral researcher 01/02/2025 - present
Developing semiconductor membranes for quantum devices.

- Fabrication semiconductor membranes in the cleanroom using lithography.
- Development of micro structured PDMS stamps for mechanical exfoliation and transfer.
- Theoretical analysis of oxide quantum dot systems.

University of Twente *Enschede, The Netherlands*
PhD correlations in topological matter 15/10/2020 - 23/10/2024
Exploring the combination of topology and electron correlations, such as superconductivity and magnetism, in various material systems. Under supervision of Alexander Brinkman and Chuan Li in the Quantum Transport in Matter group. PhD award date: 23/10/2024.

- Fabrication of thin films using molecular beam epitaxy and pulsed laser deposition.
- Mechanical exfoliation of Van der Waals materials for devices.
- Nanofabrication of devices in the cleanroom using UV and electron-beam lithography.
- Characterization of thin films and crystals using X-ray diffraction, X-ray photoelectron spectroscopy and atomic force microscopy among others.
- Transport measurements in dilution refrigerators and other low temperature magnet systems.
- Theoretical analysis using tight-binding methods and density function theory among others.
- Guiding numerous bachelor and master students during their graduation.

Stanford University *Palo Alto, Calafornia, United States*
Master internship 01/08/2019 - 15/12/2019
Internship in the group of Harold Hwang as part of my master degree, under supervision of Ruijuan Xu.

- Nanofabrication and patterning of free standing oxide perovskites
- Characterization of free standing oxide perovskites using piezoresponse force microscopy

Education

University of Twente *Enschede, The Netherlands*
MSc in Applied physics (cum laude) 01/09/2018 - 01/10/2020

- Material science track, including courses in superconductivity, nanophysics and theoretical solid state physics
- Thesis title: ’Towards a Chern insulating state in a $LaMnO_3$ bilayer’

University of Twente *Enschede, The Netherlands*
BSc in Applied physics 01/09/2015 - 31/06/2018

- Thesis title: ’Simulation of Majorana bound state control in an array of STIS junctions’.

University of Lund *Lund, Sweden*
Minor BSc Applied physics 01/08/2017 - 01/02/2018
Erasmus student at Lund University following physics courses

Supervising and mentoring activities

BSc thesis supervisor, Noah van Dijk 01/09/2023 - 09/11/2023
‘Introducing superconductive leads on magnetic topological insulating $MnBi_2Te_4$ crystal flakes’ , University of Twente.

MSc thesis supervisor, Marieke Altena 01/04/2022 - 11/11/2022
‘Adding magnetism to the Bi_xTe_y-family’, University of Twente

BSc internship supervisor, Rita Grimalt 01/02/2021 – 01/07/2021
'Tuning strain in a (111)-oriented $LaMnO_3$ bilayer to stabilize a Chern insulating phase', University of Twente.

Other activities

Teaching assistant undergraduate Quantum mechanics 2021 - 2023
Assisting seminars for second year Bachelor applied physics students in the course 'introduction to quantum mechanics'
Organization Study Tour 2018 - 2019
Part of the committee which organized a study tour to the West Coast of the United states for twenty Applied physics students for three weeks.
Chairman PION 2019
Part of the committee which organizes the physics Olympiad 2019 for all physics students in the Netherlands

Languages

English: Professional proficiency
Dutch: Native proficiency

10 Key output items

1. **PhD thesis: T. Jansen, October 2024, Topology and correlations in oxides and tellurides,** https://doi.org/10.3990/1.9789036562935 (Open Access)

My PhD thesis contributes to the understanding and development of new electronic states, with potential applications in information processing, by exploring the combination of topological and correlated materials. My research provided valuable insights and outlines promising directions for future efforts to achieve these states by combining these material properties. The quality of my thesis is demonstrated by the significant personal and professional development I achieved over the course of these four years, particularly by learning experimental techniques and developing my theoretical understanding of the field.

2. **Article, refereed: T. Jansen, E. Kochetkova, A. Isaeva, A. Brinkman and C. li, October 2024, Josephson coupling across magnetic topological insulator $MnBi_2Te_4$, Communications materials, 5, 214** https://doi.org/10.1038/s43246-024-00649-3, (Open Access)

In this publication, we demonstrate induced superconductivity for the first time in the recently discovered material $MnBi_2Te_4$, which was provided by our collaborators. I particularly enjoyed working on this project because the integration of experimental results with theoretical modelling led to significant insights into the material's properties and understanding. The quality of the publication is reflected by the academic collaborations, which led to this novel observation of superconductivity in $MnBi_2Te_4$. My specific responsibilities included formal analysis, investigation, methodology development, visualization, and drafting the original manuscript.

3. **Article, popular news: K. Wesselink and T. Jansen, October 2024, Superconductivity offers new insights into quantum material** https://www.utwente.nl/en/news/2024/10/1820408/superconductivity-offers-new-insights-into-quantum-material

Furthermore, we set the challenge to write a popular article about key output 2 for a general audience, which I enjoyed. This project shows not only my contributions to fundamental research, but also my ability to effectively communicate complex scientific concepts for a broader audience. For this item I edited the article.

4. **Article, refereed: M. Altena, T. Jansen, M. Tsvetanova and A. Brinkman, December 2023, Phase separation prevents the synthesis VBi_2Te_4 by molecular beam epitaxy, Nanomaterials, 13, 87** https://doi.org/10.3390/nano14010087 (Open Access)

This article is the outcome of a master's project that I supervised. In this project, we aimed to synthesize a magnetic topological insulator using molecular beam epitaxy and in this publication we show the limitations of this synthesizing method for this material. This project shows my ability to **supervise students** and keep them motivated throughout the project. In this project I was responsible for part of the formal analysis, the supervision and reviewing and editing the draft. The quality of this publication is reflected by the academic interest and positive words by the editor and referees.

5. **Article, refereed: T. Jansen, G. Brocks and M. Bokdam, December 2023, Phase transitions of $LaMnO_3$ and $SrRuO_3$ from DFT + U based machine learning force fields simulations, Physical review B, 108, 235122**
   https://doi.org/10.1103/PhysRevB.108.235122 (Open Access)

In this publication, we demonstrate the application of a newly developed machine learning force field method to simulate phase transitions in correlated complex oxides. This paper emerged from a theoretical side project conducted alongside my experimental PhD research, where I investigated the materials synthesized in the lab through theoretical approaches.

A key strength of this work is the interdisciplinary collaboration between experimental and theoretical fields, which enabled me to bridge computational techniques with material synthesis. My specific contributions included data curation, formal analysis, investigation, developing the software for analysis, and drafting the original manuscript

6. **Conference presentations: T. Jansen, N. Gauquelin and A. Brinkman, March 2023, Control of valency and structural properties of [111] oriented oxide interfaces.**
   https://ui.adsabs.harvard.edu/abs/2023APS..MARS39006J/abstract

In this presentation, I shared our work on [111]-oriented oxide interfaces at the American Physical Society March Meeting 2023, the largest physics conference in the world. This output shows my commitment to scientific exchange and enthusiasm for sharing our work with other experts in the field. The quality and relevance of this work were demonstrated by the strong audience engagement and the insightful discussions that followed my talk.

7. **Article, refereed: B. Folkers*, T. Jansen*, T. J. Roskamp*, P. Reith, A. Timmermans, D. Jannis, N. Gauquelin, J. Verbeeck, H. Hilgenkamp and C. M. M. Rosário, May 2024, Imaging the suppression of ferromagnetism in $LaMnO_3$ by metallic overlays, Physical Review Materials, 8, 054408,** *=contributed equally.
   https://doi.org/10.1103/PhysRevMaterials.8.054408

In this project I collaborated with my colleagues to demonstrate that a metallic overlay can suppress ferromagnetism in $LaMnO_3$. This project shows my ability to do collaborative work on a project with multiple main contributors. In this project I was responsible for sample preparation, formal analysis and writing and editing the draft.

8. **Article, refereed: R. L. Bouwmeester, T. Jansen, M. Altena, G. Koster and A. Brinkman, May 2022, Observing structural distortions in complex oxides by x-ray photoelectron diffraction, Journal of Electron spectroscopy and related phenomena, 257, 147201**
   https://doi.org/10.1016/j.elspec.2022.147201

In this work we use the exotic technique of x-ray photoelectron diffraction to study structural distortions in complex oxides. Demonstrating my skill in advanced characterization techniques and the accompanying analysis. In this project I was responsible for sample preparation, formal analysis, investigation, methodology development and editing the draft.

9. **Article, refereed: R. Xu, J. Huang, E. S. Barnard, S. Sae Hong, P. Singh, E. K. Wong, T. Jansen, V. Harbola, J. Xiao, B. Yang Wang, S. Crossley, D. Lu, S. Liu and H. Y. Hwang, June 2020, Strain-induced room-temperature ferroelectricity in $SrTiO_3$ membranes, Nature Communications, 11, 3141**
   https://doi.org/10.1038/s41467-020-16912-3 (Open access)

In this publication, we demonstrate the induction of ferroelectricity in $SrTiO_3$ membranes through strain. This output item is a result from my internship project contributions, showing that I was able to make a contribution in a short period. The project's importance to the field is reflected by its citation count. My responsibilities included investigation and visualization.

10. **Article, refereed: M. Lankhorst, T. Jansen, A. Brinkman and A. Golubov, February 2021, Majorana bound state manipulation by current pulses, Superconductor Science and Technology, 34, 035024**
    https://doi.org/10.1088/1361-6668/abdd7f

In this publication we target the audience interested in rapid single flux technology, and show how their platform in theory can be used to manipulate Majorana bound states. My role included the formal analysis, methodology, investigation and formal analysis.

Refereed publications

- T. Jansen *et al.*, “Observing structural distortions in a $LaMnO_3$ bilayer heterostructure on various [111] oriented substrates,” *Phys. Rev. Mater.*, vol. 8, no. 12, p. 125002, 2024.
- T. Jansen, E. Kochetkova, A. Isaeva, A. Brinkman, and C. Li, “Josephson coupling across magnetic topological insulator $MnBi_2Te_4$,” *Commun. Mater.*, vol. 5, no. 1, p. 214, 2024.
- B. Folkers *et al.*, “Imaging the suppression of ferromagnetism in $LaMnO_3$ by metallic overlayers,” *Phys. Rev. Mater.*, vol. 8, no. 5, p. 054408, 2024.
- M. Altena, T. Jansen, M. Tsvetanova, and A. Brinkman, “Phase Separation Prevents the Synthesis of VBi_2Te_4 by Molecular Beam Epitaxy,” *Nanomaterials*, vol. 14, no. 1, p. 87, 2023.
- T. Jansen, G. Brocks, and M. Bokdam, “Phase transitions of $LaMnO_3$ and $SrRuO_3$ from DFT+ U based machine learning force fields simulations,” *Phys. Rev. B*, vol. 108, no. 23, p. 235122, 2023.
- R. L. Bouwmeester, T. Jansen, M. Altena, G. Koster, and A. Brinkman, “Observing structural distortions in complex oxides by X-ray photoelectron diffraction,” *J. Electron Spectrosc. Relat. Phenom.*, vol. 257, p. 147201, 2022.
- T. Jansen and A. Brinkman, “External tuning of topological phase transitions induced by interaction driven mass renormalization,” *J. Phys. Condens. Matter*, vol. 34, no. 7, p. 075601, 2021.
- M. Lankhorst, T. Jansen, A. Brinkman, and A. Golubov, “Majorana bound state manipulation by current pulses,” *Supercond. Sci. Technol.*, vol. 34, no. 3, p. 035024, 2021.
- R. Xu *et al.*, “Strain-induced room-temperature ferroelectricity in $SrTiO_3$ membranes,” *Nat. Commun.*, vol. 11, no. 1, p. 3141, 2020.

Conference proceedings

- T. Jansen, E. Kochetkova, A. Isaeva, A. Brinkman, “Josephson coupling across $MnBi_2Te_4$,” in *NWO Physics 2024*, 2024.
- T. Jansen, N. Gauquelin, and A. Brinkman, “Control of valency and structural properties of [111] oriented oxide interfaces,” in *APS March Meeting Abstracts*, 2023, pp. S39-006.
- M. Altena, T. Jansen, D. H. Wielens, M. Tsvetanova, and A. Brinkman, “Adding magnetism to Bi_2Te_3/Bi_2 multilayers,” in *NWO Physics 2023*, 2023.
- T. J. Roskamp, B. Folkers, T. Jansen, N. Gauquelin, C. Rosário, and H. Hilgenkamp, “Imaging selective magnetic patterning of $Ti/LaMnO_3/SrTiO_3$ heterostructures using scanning SQUID microscopy,” in *16th European Conference on Applied Superconductivity, EUCAS 2023*, 2023.
- T. J. Roskamp, T. Jansen, B. Folkers, C. M. M. do Rosário, and H. Hilgenkamp, “Controlling ferromagnetism in $LaMnO_3/SrTiO_3$ thin films using Ti oxygen scavenging layers,” in *NEM Clusterday 2023*, 2023.

References

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