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Exploring reactive interfaces: nanoplastics, catalysts, and 2D materials

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Curriculum vitae

Tycho Roorda was born in Montréal, Canada, where he started his studies in physics at the Université de Montréal. He completed his bachelor's degree there in the year 2016, with a specialization in condensed matter physics. The final thesis was on crystal growth of $\text{Mo}_6\text{S}_6\text{I}_2$ for superconducting properties, along with several internships in plasma physics, 2D material exfoliation, and AFM analysis, which formed his base in experimental physics.

In 2016, he went on to start a Master's degree in physics at the Universiteit Leiden. There, he wrote his first thesis in the Quantum Matter and Optics group with Michiel de Dood, where he built an atomic force microscope (AFM) for the purpose of doing scanning near-field optical microscopy on superconducting single photon detectors. His final thesis, in the group of Ludo Juurlink, was on the scanning tunneling microscopy characterization of a curved platinum (111) single crystal and resulted in two publications.

After a pandemic leap year, Tycho continued his studies by starting a PhD with Irene Groot, in the Surface and Interface Science group. He set out to solve the problem of nanoplastic pollution in aquatic environments. A small step in that direction resulted in a novel way to generate nanoplastic samples in a laboratory with the purpose of studying their degradation. He became the expert on a custom and unique high temperature and high pressure operando AFM/STM setup for studying catalytic surfaces under reaction conditions. He researched the growth of hexagonal boron nitride and boron nitride-doped graphene to promote semiconducting properties. In addition, he assisted in making a silicon-like semiconductor out of graphene.

List of conferences

- **ECOSS 35 2022**, Belval, Luxembourg, August 29 - September 2, 2022
Poster Presentation: Understanding the fate of nanoplastics in aquatic environments
- **NWO CHAINS 2022**, Veldhoven, Netherlands, September 21-22, 2022
Poster Presentation: Understanding the fate of nanoplastics in aquatic environments
- **NCCC 2023**, Noordwijk, Netherlands, March 6-8, 2023
Oral Presentation: Understanding the fate of nanoplastics in aquatic environments
- **NWO Physics 2023**, Veldhoven, Netherlands, April 4-5, 2023
Oral Presentation: Understanding the fate of nanoplastics in aquatic environments
- **American Vacuum Society Conference 2023**, Portland, United States of America, November 5-10, 2023
Poster Presentation: Investigating the Fate of Nanoplastics in Aquatic Environments
- **Reedijk symposium 2023**, Leiden, Netherlands, November 17, 2023
Poster Presentation: Understanding the fate of nanoplastics in aquatic environments
- **NWO Physics 2024**, Veldhoven, Netherlands, January 23–24, 2024
- **NCAFM 2025**, Montreal, Canada, August 5-9, 2024
Oral Presentation: High temperature, high pressure scanning with the ReactorAFM
- **NWO Physics 2025**, Veldhoven, Netherlands, January 21–22, 2025

List of courses

- **Academic Integrity and Ethics Review**, Leiden University
- **Applied Vacuum Technology**, De Nederlandse Vacuümvereniging (NEVAC)

List of publications

Chapter 3:

Roorda T., Achour H., van Spronsen M.A., Cañas-Ventura M.E., Roobol S.B., Onderwaater W., Bergman M., van der Tuijn P., van Baarle G.J.C., Bakker J.W., Frenken J.W.M, Groot, I.M.N., ReactorAFM/STM – dynamic reactions on surfaces at elevated temperature and atmospheric pressure. *Beilstein Journal of Nanotechnology*. 2025 Mar 21;16(1):397-406.

Chapter 4:

Development of protocols for lab-based nanoplastic research
Manuscript in preparation

Chapter 5:

Campos-Jara S., **Roorda T.**, de Jong L.P.M., Virchenko V.S., Jiao A., Prieto M.J., Tanase L.C., Mawass M.A., Hsueh J.W., Calvi V., van Os J., Félez-Guerrero N., Monsma R., van Rijn R., Schmidt T., Schneider G., Groot I.M.N., Novel Precursor for h-BN Synthesis on Ni (111) Substrates. *The Journal of Physical Chemistry C*. 2025 Aug 20.

Other Publications:

Roorda T., Auras S.V., Juurlink L.B.F., Chiral Surface Characterisation and Reactivity Toward H–D Exchange of a Curved Platinum Crystal. *Topics in Catalysis*. 2020 Nov;63(15):1558-68.

Auras S.V., van Lent R., Bashlakov D., Piñeiros Bastidas J.M., **Roorda T.**, Spierenburg R., Juurlink L.B.F., Scaling platinum-catalyzed hydrogen dissociation on corrugated surfaces. *Angewandte Chemie*. 2020 Nov 16;132(47):21159-65.

Small Bandgap Opening of Graphene via Incorporation of BN-rings
Manuscript in preparation

Synthesis and Characterization of Boron Nitride-doped Graphene on Ni(111)
Manuscript in preparation

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There seems to be a level of appreciation correlated to the amount of hours I spend in a kayak with someone, Jouke. Rêve, for not only designing a cover which represents these 4 years of my life but also being a big part of it. My friends.

Lastly, my biggest inspirations. My parents, Sjoerd Roorda and Ragnhild Hettema. My brother Sieger. My partner, my person, Sacha.