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## **Oxidation catalysis on Pt and Au : complexity of simple chemistry**

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The travel grant of the Royal Society of Chemistry was highly valued. This grant was used to present my work on CO oxidation over Au(310) at the Gold 2015 conference in Cardiff, the United Kingdom.

## List of publications

## Peer-reviewed publications

1. M.A. van Spronsen, J.W.M. Frenken, and I.M.N. Groot

*Oxidation of Pt(111) at elevated temperature and high pressure: The formation of novel surface oxides*, to be published

2. P.V. Dudin, Y.I. Yanson, N. Vasiljevic, M.T.M. Koper, J.W.M. Frenken, and M.A. van Spronsen

*Gold-coated tungsten tips for imaging in reactive environments with scanning tunneling microscopy*, to be published

3. S. B. Roobol, W. G. Onderwaater, M. A. van Spronsen, F. Carla, O. Balmes, V. Navarro, S. Vendelbo, P. J. Kooyman, C. F. Elkjær, S. Helveg, R. Felici, J. W. M. Frenken, and I. M. N. Groot

*Operando studies of NO reduction by H<sub>2</sub> over Pt using surface X-ray diffraction and transmission electron microscopy*, to be published

4. J.M. de Voogd, M.A. van Spronsen, O. Ostojić, A.M.J. den Haan, I.M.N. Groot, T.H. Oosterkamp, F.E. Kalf, B. Bryant, A.F. Otte, and M.J. Rost

*Fast and Reliable Pre-Approach for Scanning Probe Microscopes based on Tip-Sample Capacitance*, to be published

5. M.A. van Spronsen, C.J. Weststrate, and L.B.F. Juurlink

*The role of water in Au-catalyzed CO oxidation at low-coordination sites*, submitted

6. V. Navarro, M.A. van Spronsen, and J.W.M. Frenken

*In situ observation of self-assembled Fischer-Tropsch products on a cobalt catalyst*, submitted

7. M.A. van Spronsen, C.J. Weststrate, A. den Dunnen, M.E. van Reijzen, C. Hahn, and L.B.F. Juurlink

*Hydrophilic interaction between low-coordinated Au and water: H<sub>2</sub>O/Au(310) studied with TPD and XPS*

*J. Phys. Chem. C* **2016**, *120*, 8693–8703,  
<http://dx.doi.org/10.1021/acs.jpcc.6b00912>

8. M.A. van Spronsen, G.J.C. van Baarle, C.T. Herbschleb, J.W.M. Frenken, and I.M.N. Groot

*High-pressure operando STM studies giving insight in CO oxidation and NO reduction over Pt(1 1 0)*

*Catal. Today* **2015**, *244*, 85–95,  
<http://dx.doi.org/10.1016/j.cattod.2014.07.008>

*Erratum to “High-pressure operando STM studies giving insight in CO oxidation and NO reduction over Pt(1 1 0)” [Catal. Today 244 (2015) 85–95]*

*Catal. Today* **2015**, *256*, Part 2, 384,  
<http://dx.doi.org/10.1016/j.cattod.2015.05.002>

9. S.B. Roobol, M.E. Cañas-Ventura, M. Bergman, M.A. van Spronsen, W.G. Onderwaater, P.C. van der Tuijn, R. Koehler, A. Ofitserov, G.J.C. van Baarle, and J.W.M. Frenken

*The ReactorAFM: Non-contact atomic force microscope operating under high-pressure and high-temperature catalytic conditions*

*Rev. Sci. Instrum.* **2015**, *86*, 033706, <http://dx.doi.org/10.1063/1.4916194>

10. C.T. Herbschleb, P.C. van der Tuijn, S.B. Roobol, V. Navarro, J.W. Bakker, Q. Liu, D. Stoltz, M.E. Cañas-Ventura, G. Verdoes, M.A. van Spronsen, M. Bergman, L. Crama, I. Taminiau, A. Ofitserov, G.J.C. van Baarle, and J.W.M. Frenken

*The ReactorSTM: Atomically resolved scanning tunneling microscopy under high-pressure, high-temperature catalytic reaction conditions*

*Rev. Sci. Instrum.* **2014**, *85*, 083703, <http://dx.doi.org/10.1063/1.4891811>

11. L.R. Baker, G. Kennedy, J.M. Krier, M.A. van Spronsen, R.M. Onorato, and G.A. Somorjai

*The Role of an Organic Cap in Nanoparticle Catalysis: Reversible Restructuring of Carbonaceous Material Controls Catalytic Activity of Platinum Nanoparticles for Ethylene Hydrogenation and Methanol Oxidation*

*Catal. Lett.* **2012**, *142*, 1286–1294,  
<http://dx.doi.org/10.1007/s10562-012-0904-3>

12. L.R. Baker, G. Kennedy, M.A. van Spronsen, A. Hervier, X. Cai, S. Chen, L.-W. Wang, and G.A. Somorjai

*Furfuraldehyde Hydrogenation on Titanium Oxide-Supported Platinum Nanoparticles Studied by Sum Frequency Generation Vibrational Spectroscopy: Acid-Base Catalysis Explains the Molecular Origin of Strong Metal-Support Interactions*

*J. Am. Chem. Soc.* **2012**, *134*, 14208–14216,  
<http://dx.doi.org/10.1021/ja306079h>

13. M.E. van Reijzen, M.A. van Spronsen, J. Doctor, and L.B.F. Juurlink

*CO and H<sub>2</sub>O adsorption and reaction on Au(310)*

*Surf. Sci.* **2011**, *605*, 1726–1731,  
<http://dx.doi.org/10.1016/j.susc.2011.06.006>

### Other publications, interviews, etc.

1. M.A. van Spronsen, J.W.M. Frenken, and I.M.N. Groot

*De actieve fase van een katalysator bestudeerd met de perfecte combinatie van experimenten onder hoge druk en vacuümtechnologie*

Article competed for the NEVAC Prize, Dutch Vacuum Society (2015)

2. Interviewed for: A. Dijkgraaf, *Inzoomen op de kat*, C2W, Dutch Chemical Society (2015)



# Curriculum vitae

Matthijs André van Spronsen was born in Leiderdorp, the Netherlands, on March 8, 1987. He graduated from gymnasium<sup>6</sup> at the Bonaventura College in Leiden in 2005, with a major in the natural sciences. Van Spronsen finished his B.Sc. degree in Chemistry with a research project focusing on the interaction between CO and H atoms towards understanding interstellar methanol formation. This was a theoretical project and a collaboration between the group of Prof. Dr. Ewine F. van Dishoeck and the group of Prof. Dr. Geert-Jan Kroes under the daily supervision of Dr. Stefan Andersson.

Van Spronsen's experimental research project for his M.Sc. degree in Chemistry was conducted in the group of Dr. Ludo B.F. Juurlink and was devoted to the interaction between H<sub>2</sub>O and CO on a stepped surface of a Au single crystal. Before graduating cum laude, he spent a semester in the group of Prof. Dr. Gabor A. Somorjai at the University of California, Berkeley and the Lawrence Berkeley National Laboratory in California, the United States of America. In this project, van Spronsen performed a kinetic study to probe the role of the support on Pt nanoparticles in several reactions.

Van Spronsen performed the research for his PhD degree in the group of Prof. Dr. Joost W.M. Frenken in the Leiden Institute of Physics (LION) of Leiden University. After Frenken accepted a position as director of the Advanced Research Center for Nanolithography in 2014, Dr. Irene M.N. Groot started leading the research group and became a copromoter of van Spronsen. The original scope of his PhD project was the combination of in situ STM and AFM. During the project, the scope was widened to incorporate the STM studies in this thesis. Van Spronsen did many chemical experiments using the ReactorSTM. Furthermore, he did experiments at the Elettra Synchrotron, Trieste, Italy under the supervision of Juurlink, his second copromotor.

After defending his PhD thesis, van Spronsen plans to continue his scientific career as a postdoctoral fellow in the group of Prof. Dr. Cynthia M. Friend at Harvard University in Cambridge, Massachusetts, the United States of America.

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<sup>6</sup>preuniversity education including ancient Greek

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