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Cathodic corrosion

Hersbach, T.J.P.

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List of Publications

This thesis is based on the following publications

Chapter 2

Hersbach, T. J. P., Yanson, A. I. & Koper, M. T. M.
Anisotropic Etching of Platinum Electrodes at the Onset of Cathodic Corrosion
Nature Communications **7**, 12653 (2016)

Chapter 3

Hersbach, T. J. P., Mints, V. A., Calle-Vallejo, F., Yanson, A. I. & Koper, M. T. M.
Anisotropic Etching of Rhodium and Gold as the Onset of Nanoparticle Formation by Cathodic Corrosion
Faraday Discussions **193**, 207–222 (2016)

Chapter 4

Hersbach, T. J. P., McCrum, I. T., Anastasiadou, D., Wever, R., Calle-Vallejo, F. & Koper, M. T. M.
Alkali Metal Cation Effects in Structuring Pt, Rh, and Au Surfaces through Cathodic Corrosion
ACS Applied Materials & Interfaces **10**, 39363–39379 (2018)

Chapter 7

Hersbach, T. J. P., Kortlever, R., Lehtimäki, M., Krtil, P. & Koper, M. T. M.
Local Structure and Composition of PtRh Nanoparticles Produced through Cathodic Corrosion
Physical Chemistry Chemical Physics **19**, 10301–10308 (2017)

Other publications

Díaz-Morales, O.,* Hersbach, T. J. P.,* Badan, C., Garcia, A. C. & Koper, M. T. M.
Hydrogen Adsorption on Nano-Structured Platinum Electrodes
Faraday Discussions **210**, 301–315 (2018)
*Both authors contributed equally.

Seitz, L. C., Hersbach, T. J. P., Nordlund, D. & Jaramillo, T. F.
Enhancement Effect of Noble Metals on Manganese Oxide for the Oxygen Evolution Reaction
The Journal of Physical Chemistry Letters **6**, 4178–4183 (2015)

Díaz-Morales, O., Hersbach, T. J. P., Hetterscheid, D. G. H., Reek, J. N. H. & Koper, M. T. M.
Electrochemical and Spectroelectrochemical Characterization of an Iridium-Based Molecular Catalyst for Water Splitting: Turnover Frequencies, Stability, and Electrolyte Effects
Journal of the American Chemical Society **136**, 10432–10439 (2014)

Kwon, Y., Hersbach, T. J. P. & Koper, M. T. M.
Electro-Oxidation of Glycerol on Platinum Modified by Adatoms: Activity and Selectivity Effects
Topics in Catalysis **57**, 1272–1276 (2014)

Curriculum Vitae

Thom Hersbach was born in 1991 in Purmerend, the Netherlands. Here, he attended high school between 2003 and 2009 at the Da Vinci College, specializing in the "Natuur & Techniek" direction. During high school, Thom participated in the team-based "Extra Talent Project" at the Free University in Amsterdam. His team, supervised by Frank Postma, won the first prize.

After graduating high school *"Cum Laude"*, Thom studied Molecular Science & Technology from 2009 to 2012 at the Technical University of Delft and Leiden University. His BSc degree was obtained *"Cum Laude"* as well. Majoring in Chemistry and minoring in Sustainable Development, Thom wrote his thesis on electrochemical glycerol oxidation in the group of Prof. Dr. Marc Koper at Leiden University, under the supervision of Youngkook Kwon.

Thom remained at Leiden University to pursue his MSc degree in Research in Chemistry (2012–2014), following the "Physical & Theoretical" specialization. Two research projects were carried out during the MSc program. The first project, concerning electrochemical oxygen evolution on an immobilized Ir-based molecular complex, was performed in the group of Prof. Dr. Marc Koper at Leiden University, under the supervision of Oscar Díaz-Morales. The second project, studying the enhancing effects of noble metals on the electrochemical oxygen evolution activity of 3d-metal oxides, was carried out in the group of Prof. Dr. Thomas Jaramillo at Stanford University, under the supervision of Linsey Seitz. During his MSc, Thom additionally won the third prize in the 2013 "Green Brain of the Year" competition of the Middle East Technical University (with Andrei Fedorovski) and was awarded the 2013/2014 title of "Best Chemistry Student" at Leiden University. Thom then obtained his MSc degree *"Cum Laude"* in 2014.

This year also marked the start of Thom's PhD project at Leiden University, guided by Prof. Dr. Marc Koper. The project focused on fundamentally understanding cathodic corrosion. The first year of the project was predominantly spent making nanoparticles and developing a methodology to corrode and carefully characterize metallic electrodes. The produced nanoparticles would lead to Chapter 7, whereas the developed methodology would form the basis for Chapter 2–4 and Chapter 6. Additional experiments at the Stanford Synchrotron Radiation Lightsource would lead to Chapter 5. The PhD project yielded the multifaceted study of cathodic corrosion that is presented in this thesis. Given the multidisciplinary approach of the project, Thom had the great privilege to collaborate

with and learn from many talented scientists.

During the PhD project, Thom assisted in teaching the BSc classes "General and Inorganic Chemistry" & "Physical Chemistry and Kinetics", as well as the BSc practical course "Basic Practical Skills". He was also awarded the honor of designing the cover image of Volume 193 of the Faraday Discussions proceedings in collaboration with Victoria Flores. Thom was additionally awarded the poster prize at the 2016 HRSMC symposium in Leiden, The Netherlands, and the NIOK lecture award at the 2017 NCCC conference in Noordwijkerhout, The Netherlands.

Following the obtainment of his doctorate degree, Thom will continue his academic career as a post-doctoral researcher in the group of Prof. Dr. Richard Crooks at the University of Texas at Austin. In this position, Thom hopes to use dendrimer-encapsulated nanoparticles as models for developing improved nano-sized catalysts. He additionally aims to pursue his interests of running, reading and brewing the tastiest of beers.