CURRICULUM VITAE

Maxime van der Heijden

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I aim to become a leader in the science and engineering of electrochemical energy technologies, which is key for the energy transition. I aspire to perform impactful research, with a focus on open-source science, and to mentor young scientists to achieve their full potential and tackle important societal problems.

Academic history

Dec. 2023 – present **Postdoctoral Researcher Chemical Engineering and Chemistry**
Eindhoven University of Technology
Research group: Electrochemical Materials and Systems

Nov. 2019 – Dec. 2023 **PhD Candidate Chemical Engineering and Chemistry**
Eindhoven University of Technology
Research group: Electrochemical Materials and Systems & Membrane Materials and Processes
Subject: *Engineering porous electrodes for redox flow batteries – modeling, manufacturing, and diagnostics*

- Developed a pore network model for porous electrodes
- Coupled a genetic algorithm and pore network model for bottom-up design of porous electrodes
- Manufactured stereolithography 3D printed and carbonized porous structures
- Developed operando and ex-situ imaging diagnostics for electrodes using neutron radiography and X-ray tomography
- Performed electrochemical diagnostics and characterization experiments

Sept. 2017 – Aug. 2019 **Master Molecular Systems and Materials Chemistry**
Eindhoven University of Technology
Research group: Stimuli-responsive Functional Materials and Devices
Subject: *Multi dye coordination in layered smectics for luminescent solar concentrator applications*

Sept. 2014 – Jul. 2017 **Bachelor Chemical Engineering and Chemistry**
Eindhoven University of Technology
Research group: Stimuli-responsive Functional Materials and Devices
Subject: *Complex patterning of Luminescent Solar Concentrators for Improved Aesthetics*

Practical experience

May 2019 – Aug. 2019 **Graduation Internship**
DSM Coating Resins, Department Printing & Packaging, Waalwijk
Subject: *Receptive coatings for inkjet formulations*.

Aug. 2016 – Feb. 2019 **Student-assistant,** Euflex employment services
Eindhoven University of Technology, Department of Chemical Engineering and Chemistry

- **Tutor design-based learning nanotechnology** (Oct. 2018 – Feb. 2019)
  Supervising meetings of first-year students
- **Mentor VWO workweek** (Aug. 2018)

Supervising VWO students on a chemistry related project

- **Studentmentor** (Aug. 2016 – Jul. 2018)
  Supervising first-year students, the Study-Choice, and Check-your-match days

Dec. 2014 – Jul. 2016 **Tutoring LOOT-students**
Sint-Joriscollege, Eindhoven
Tutoring (mathematics/chemistry/physics) students who participate in top sport

Publications

[9] V. Muñoz Perales*, M. van der Heijden*, V. de Haas, J. Olinga, M. Vera, A. Forner-Cuenca, Understanding the Role of Electrode Thickness on Redox Flow Cell Performance (2023), *ChemElectroChem*, **11**, 2, e202300380. https://chemistry-europe.onlinelibrary.wiley.com/doi/full/10.1002/celc.202300380

[8] M. van der Heijden, M. Kroese, Z. Borneman, A. Forner-Cuenca (2023), Investigating mass transfer relationships in stereolithography 3D printed electrodes for redox flow batteries, *Advanced Materials Technologies*, **8**, 18, 2300611. https://onlinelibrary.wiley.com/doi/full/10.1002/admt.202300611

[7] V. Muñoz-Perales, M. van der Heijden, P.A. Garcia-Salaberri, M.V. Coello, A. Forner-Cuenca, Engineering Lung-inspired Flow Field Geometries for Redox Flow Batteries with Stereolithography 3D Printing (2023), *ACS Sustainable Chemistry and Engineering,* **11**, 12243−12255.
https://pubs.acs.org/doi/full/10.1021/acssuschemeng.3c00848

[6] R. van Gorp*, M. van der Heijden*, M.A. Sadeghi, J. Gostick, A. Forner-Cuenca (2023), Bottom-up design of porous electrodes by combining a genetic algorithm and a pore network model, *Chemical Engineering Journal*, **455**, 139947. https://www.sciencedirect.com/science/article/pii/S1385894722054274
With the algorithm available at *https://github.com/MaximevdHeijden/GA-RFB-electrode*

[5] M. van der Heijden*, R. van Gorp*, M.A. Sadeghi, J. Gostick, A. Forner-Cuenca (2022), Assessing the Versatility and Robustness of Pore Network Modeling to Simulate Redox Flow Battery Electrode Performance, *Journal of the Electrochemical Society*, **169**, 4, 040505. https://iopscience.iop.org/article/10.1149/1945-7111/ac5e46/meta
With the algorithm available at *https://github.com/MaximevdHeijden/PNM-RFB-electrode*
Focus Issue on Women in Electrochemistry.

[4] M. van der Heijden, A. Forner-Cuenca (2022), Transport Phenomena and Cell Overpotentials in Redox Flow Batteries, In: *Luisa F. Cabeza (eds.), Encyclopedia of Energy Storage; Oxford: Elsevier*, **2**, 480-499. https://www.sciencedirect.com/science/article/pii/B9780128197233001323

[3] K.M. Tenny, K.V. Greco, M. van der Heijden, T. Pini, A. Mularczyk, A. Vasile, J. Eller, A. Forner-Cuenca, Y. Chiang, F.R. Brushett (2022), A Comparative Study of Compressive Effects on the Morphology and Performance of Carbon Paper and Cloth Electrodes in Redox Flow Batteries, *Energy Technology*, **10**, 2101162. https://onlinelibrary.wiley.com/doi/full/10.1002/ente.202101162

[2] G. Timmermans, M. van der Heijden, B.M. Oosterlaken, S.C.J. Meskers, A.P.H.J. Schenning, M.G. Debije (2020), Flexible Nanoporous Liquid Crystal Networks as Matrixes for Förster Resonance Energy Transfer (FRET), *ACS Applied Nano Materials*, **3**, 4, 3904–3909. https://pubs.acs.org/doi/10.1021/acsanm.0c00622

[1] J. ter Schiphorst, M.L.M.K.H.Y.K. Cheng, M. van der Heijden, R.L. Hageman, E.L. Bugg, T.J.L. Wagenaar, M.G. Debije (2020), Printed luminescent solar concentrators: Artistic renewable energy, *Energy and Buildings*, **207**, 109625. https://www.sciencedirect.com/science/article/pii/S0378778819328671

Pre-prints

[11] M. van der Heijden, G. Szendrei, V. de Haas, A. Forner-Cuenca, A versatile optimization framework for porous electrode design (2023), https://chemrxiv.org/engage/chemrxiv/article-details/6560c531cf8b3c3cd70785eb. Submitted to *Digital Discovery*

[10] R.R. Jacquemond*, M. van der Heijden*, E.B. Boz*, E.R.C. Ruiz, K.V. Greco, J.A. Kowalski, V. Muñoz Perales, F.R. Brushett, D.C. Nijmeijer, P. Boillat, A. Forner-Cuenca, Unravelling Concentration Profiles in Redox Flow Batteries Using Neutron Radiography (2023), *ChemRxiv*. https://chemrxiv.org/engage/chemrxiv/article-details/64e77958dd1a73847f6d8c15
Under review for *Nature Communications*

Submitted

[12] E.B. Boz, M. van der Heijden, R.R. Jacquemond, P. Boillat, J. Hjelm, A. Forner-Cuenca, Correlating electrolyte infiltration with accessible surface area in microporous electrodes using neutron radiography.
Submitted to *Journal of the Electrochemical Society*

PhD Thesis

M. van der Heijden, Engineering porous electrodes for redox flow batteries – modeling, diagnostics, and manufacturing (2023), *Eindhoven University of Technology*, https://maximevdheijden.github.io/public/files/Thesis%20M%20van%20der%20Heijden%2013112023%20-%20with%20cover.pdf .

*Co-first authors

Peer-review

May 2023	**IOP Peer Review Excellence certificate**
May 2023 – present	**Peer reviewer for the following Journals:** • Joule • ACS Applied Energy Materials • Current Opinion in Electrochemistry • Journal of Open Source Software

Presentations

[14] M. van der Heijden, Marit Kroese, Jacky Olinga, Zandrie Borneman, Antoni Forner-Cuenca, Stereolithography 3D Printing As a Versatile Tool to Manufacture Porous Electrodes for Redox Flow Batteries, Oral presentation at the 244th Electrochemical Society Meeting, Gothenburg, Sweden, 2023.

[13] M. van der Heijden, R. van Gorp, G. Szendrei, V. de Haas, M.A. Sadeghi, J. Gostick, A. Forner-Cuenca, Starting from the Bottom: Coupling a Genetic Algorithm and a Pore Network Model for Porous Electrode Design, In-person invited lecture at Columbia University, New York, US, 2023.

[12] M. van der Heijden, R. van Gorp, G. Szendrei, V. de Haas, M.A. Sadeghi, J. Gostick, A. Forner-Cuenca, Starting from the Bottom: Coupling a Genetic Algorithm and a Pore Network Model for Porous Electrode Design, Oral presentation at the 243rd Electrochemical Society Meeting, Boston, US, 2023.

[11] M. van der Heijden, M. Kroese, Z. Borneman, A. Forner-Cuenca, Investigating Mass Transfer Relationships in Stereolithography-Based 3D Printed Electrodes for Redox Flow Batteries, Poster presentation at the 243rd Electrochemical Society Meeting, Boston, US, 2023.

[10] M. van der Heijden, R. van Gorp, G. Szendrei, V. de Haas, M.A. Sadeghi, J. Gostick, A. Forner-Cuenca, Starting from the bottom: Coupling a genetic algorithm and a pore network model for porous electrode optimization, Oral presentation at the 15th Annual InterPore Meeting, Edinburgh, Scotland, 2023.

[9] M. van der Heijden, M. Kroese, Z. Borneman, A. Forner-Cuenca, Investigating mass transfer relationships in stereolithography 3D printed electrodes for redox flow batteries, Poster presentation at the 15th Annual InterPore Meeting, Edinburgh, Scotland, 2023.

[8] M. van der Heijden, R. van Gorp, G. Szendrei, V. de Haas, M.A. Sadeghi, J. Gostick, A. Forner-Cuenca, Coupling a genetic algorithm and a pore network model for redox flow battery porous electrode optimization, Oral presentation at the 19th ModVal Symposium, Duisburg, Germany, 2023.

[7] M. van der Heijden, R. van Gorp, G. Szendrei, M.A. Sadeghi, J. Gostick, A. Forner-Cuenca, Towards bottom-up design of porous electrode microstructures – An approach coupling evolutionary algorithms and pore network modeling, Oral presentation at the 241st Electrochemical Society Meeting, Vancouver, Canada, 2022.

[6] M. van der Heijden, R. van Gorp, G. Szendrei, M.A. Sadeghi, J. Gostick, A. Forner-Cuenca, Towards bottom-up design of porous electrode microstructures – coupling evolutionary algorithms and pore network modelling, Oral presentation at the 17th Netherlands Process technology Symposium, Delft, The Netherlands, 2022.

[5] M. van der Heijden, R. van Gorp, G. Szendrei, A. Borneman, A. Forner-Cuenca, Towards bottom-up design of porous electrode microstructures for redox flow batteries, Oral invited presentation at the Porous Media Tea Time Talks, Online, Session 20, YouTube, 2021.

[4] M. van der Heijden, R. van Gorp, G. Szendrei, M.A. Sadeghi, J. Gostick, Z. Borneman, A. Forner-Cuenca, Towards bottom-up design of porous electrode microstructures - coupling genetic algorithms with pore network modeling of redox flow battery electrodes, Poster and recorded oral presentation at the 13th Annual InterPore Meeting, Online, 2021. **Awarded with the students poster award out of the 104 posters.**

[3] M. van der Heijden, R. van Gorp, G. Szendrei, Z. Borneman, A. Forner-Cuenca, Optimizing the 3D Microstructure of Redox Flow Battery Electrodes, Poster and recorded pitch at CHAINS 2020, Online, 2020.

[2] M. van der Heijden, Z. Borneman, A. Forner-Cuenca, Optimizing the 3D microstructure of redox flow battery electrodes, Poster presentation at the 2020 Membrane Symposium, Essen, 2020.

[1] R.R. Jacquemond*, M. van der Heijden*, Z. Borneman, D.C. Nijmeijer, A. Forner-Cuenca, Towards Bottom-up Engineered Electrodes for Redox Flow Batteries, Poster presentation at the 1st ECCM graduate school, Eerbeek, 2019.

Teaching and supervision

Feb. 2020 – Jul. 2022 **Teaching assistant Separation Technology,** Bachelor course, 3 semesters
Preparation and lecturing the guided self-studies, construction of the answer sheets for the exercises, group assignments and exams, and correction of the group assignments and exams.

Nov. 2019 - present **Supervision of Master/HBO students**

- **Jacky Olinga** (2023-present), Master student. *Visualization of reactive mass transfer in redox flow batteries using confocal microscopy*
- **Victor de Haas** (2022-2023), Master student. *Topology optimization to co-design flow fields and porous electrodes for redox flow batteries*
- **Marit Kroese** (2021-2022), Master student. *3D-printing of optimized electrode microstructures for organic redox flow batteries*
- **Nard Schellekens** (2021), HBO student. *Exploring the role of porosity gradients in redox flow battery electrodes*
- **Gabor Szendrei** (2020-2021), Master student. *Topology optimization of porous electrodes for redox flow batteries*
- **Rik van Gorp** (2019-2020), Master student. *Exploring the role of the porous electrode microstructure in redox flow battery performance*

Awards and grants

Sept. 2017 – Sept. 2019	**Topsector Chemistry Scholarship,** VNCI, DSM Two-year student grant for excellent master students in Chemistry, sponsored by DSM. The award is given by companies to talented and motivated MSc Chemistry and Chemical Engineering students in the Netherlands.
Jun. 2021	**Student Poster Award,** InterPore 2021 Poster title: *Towards bottom-up design of porous electrode microstructures – coupling genetic algorithms with pore network modeling of redox flow battery electrodes* This award is given in recognition of outstanding student poster presentations at the annual InterPore conference.
Mar. 2021	**Travel Grant Battery Division,** ECS Boston 2023 Presentation title: *Starting from the Bottom: Coupling a Genetic Algorithm and a Pore Network Model for Porous Electrode Design* This award is given in recognition of promising students in the science and engineering areas of electrochemical energy storage and conversion.

Skills and Techniques

Languages	Dutch (native), English (fluent), and German (basic)
Simulations	Pore network modeling, Genetic optimization, Python (Sypder, Jupyter notebook), MATLAB
Characterization	X-ray tomography, Neutron radiography, Electrochemical measurements, SEM, EDX, TGA, FTIR, UV/VIS/NIR spectrophotometry, POM, Surface profilometry, FRET measurements, Edge-emission measurements, Adhesion tests, Viscosity measurements
Manufacturing	3D SLA printing, Coating of porous materials, Carbonization, Inkjet printing, Spray-coating, Photopolymerization, Liquid crystal films, Coating formulation,
Other software	Origin, AUTOCAD, ChemDraw, Paraview, Geodict