

## UniSysCat - Colloquium

Dr. Michelle Browne

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Start Time: Wednesday, March 26, 2025 05:15 pm

End Time: Wednesday, March 26, 2025 06:30 pm

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or via Zoom

### Beyond Conventional Metal Oxide Catalysts for the Oxygen Evolution Reaction

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In the Electrocatalysis: Synthesis to Devices Group at Helmholtz-Zentrum Berlin, one of our research paths is focused on combining MXenes and water splitting active materials to create the next generation Oxygen Evolution Reaction (OER) catalysts.<sup>1, 2</sup> Metal oxides are known to be active for the OER but lack high conductivity.

On the other hand, MXenes are highly conductive but oxidise readily under several conditions due to its termination sites and don't contain OER active sites.<sup>3</sup> To overcome these issues, we employ several strategies in our group to combine these two materials to make materials that are OER active and highly conductive. Furthermore, by blocking the MXene termination sites with a metal-based material, this may lead to less oxidation of the MXenes structure.

Furthermore, our group is also investigating into different methods for the fabrication of OER catalysts with and without MXenes in order to make more efficient catalyst layers. This presentation will focus on the development of hybrid MXene and non-MXene materials for the OER through various fabrication methods to produce Green H<sub>2</sub>.<sup>4, 5</sup>

#### References

1. Y. Gogotsi and Q. Huang, ACS Nano, 2021, **15**, 5775-5780.>
2. M. P. Browne, D. Tyndall and V. Nicolosi, Current Opinion in Electrochemistry, 2022, **34**,

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3. D. Tyndall, L. Gannon, L. Hughes, J. Carolan, S. Pinilla, S. Jaśkaniec, D. Spurling, O. Ronan, C. McGuinness, N. McEvoy, V. Nicolosi and M. P. Browne, *npj 2D Materials and Applications*, 2023, **7**, 15.

4. C. Kaplan, R. M. Restrepo, T. Schultz, K. Li, V. Nicolosi, N. Koch and M. P. Browne, *Electrochimica Acta*, 2024, **490**, 144269.

5. B. Schmiedecke, B. Wu, T. Schultz, A. A. Emerenciano, N. Sharma, D. A. Douglas-Henry, A. Koutsioukis, M. T. Görüryılmaz, V. Nicolosi, T. Petit, N. Koch, Z. Sofer and M. P. Browne, *Journal of Materials Chemistry A*, 2024, DOI: 10.1039/D4TA02700K.

Prof. Dr. Roel van de Krol

Organizer