Towards reducing the anodic Ir loading in PEM water electrolysers

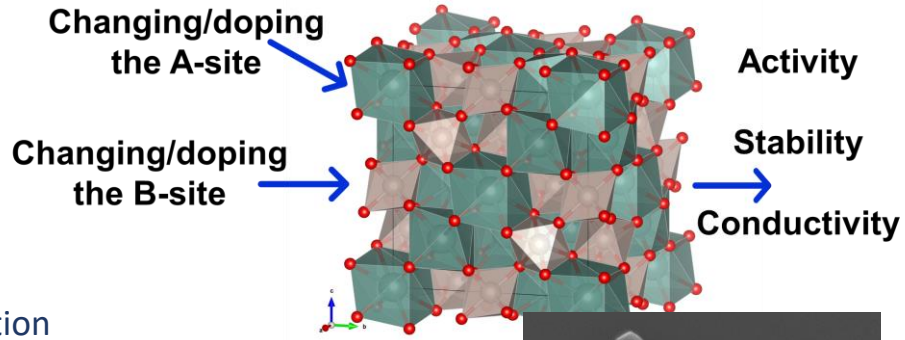
Introduction

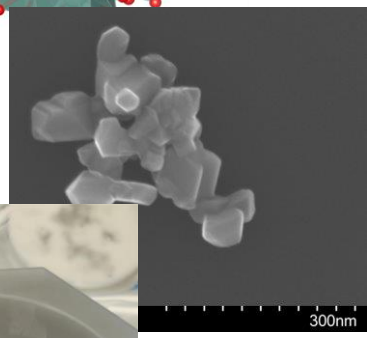
Hydrogen production through PEM water electrolysis (PEMWE) is:

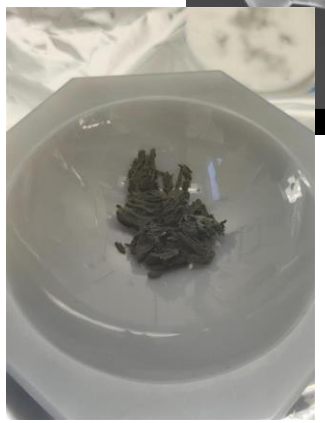
- ✓ Flexible and compact
- ✓ Energy efficient
- ✓ Able to function with load changes

Expensive and scarce Ir used as oxygen evolution reaction (OER) electrocatalyst limits the large-scale implementation.
Ruthenium oxide is another excellent OER electrocatayst, but has poor stability.

We investigate ruthenium pyrochlores ($Y_2Ru_2O_7$) to increase the stability of Ru and reduce the reliance on Ir. These pyrochlores are reported to have better OER activity than IrO_2[1,2]







References:

(1) Feng, Q.; Wang, Q.; Zhang, Z.; Xiong, Y.; Li, H.; Yao, Y.; Yuan, X.-Z.; Williams, M. C.; Gu, M.; Chen, H. Highly Active and Stable Ruthenate Pyrochlore for Enhanced Oxygen Evolution Reaction in Acidic Medium Electrolysis. Appl. Catal. B Environ. 2019, 244, 494–501.

(2) Kim, J.; Shih, P.-C.; Tsao, K.-C.; Pan, Y.-T.; Yin, X.; Sun, C.-J.; Yang, H. High-Performance Pyrochlore-Type Yttrium Ruthenate Electrocatalyst for Oxygen Evolution Reaction in Acidic Media. J. Am. Chem. Soc. 2017, 139 (34), 12076–12083.

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HOPE project (Revolutionizing Green Hydrogen Production with Next Generation PEM Water Electrolyser Electrodes

I am passionate about conducting research pertaining to the green energy transition. I have a strong background in (electro)chemistry. I have conducted research on various OER electrocatalysts using electrochemical, physical and in-situ techniques (such as Raman spectroscopy).

Estimated progress of the PhD project:

Just started ...	< 50 %	> 50 %	Almost done ☺

Primary objective

Reduce the anodic Ir loading in PEMWE

Secondary objectives

- Optimise the synthesis method and doping strategy of the pyrochlores to obtain active and stable electrocatalysts.
- Develop standardised and rigorous methods to physically characterise the material and test activity and stability.

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