# Minority bulk and surface proton conduction in ceramic positrodes for proton ceramic electrochemical cells

## Introduction

The positrode is critical for proton ceramic electrochemical cells for **hydrogen** and ammonia, as a major contribution to the over-potentials and hence losses in the whole cell. It is challenging to characterise the proton transport in predominantly electronic conductors.

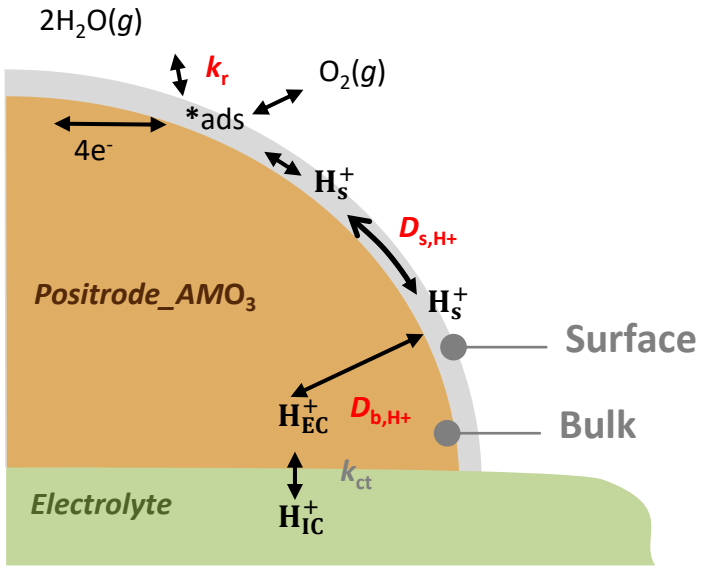
We want to establish theory and methodology for **measuring minority protonic** conductivities in electronic conductors. The results will be used as input to other project which perform computer simulations to seek strategies for optimization and effects on electrodes in scaled-up cells.

## Primary objective

- Proton conduction in the bulk and on surfaces of positrode materials.

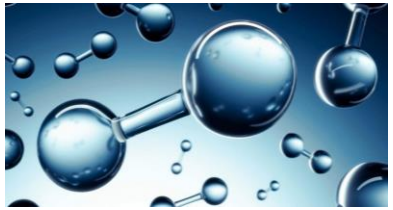
## Secondary objectives

- Surface protonic conductance by proton flux.
- Proton conduction on conductive metal oxides.
- Brick layer model for mixed electronic and protonic conductive positrodes.




$$j_{H^+} = -D_{H_b^+}\frac{dc_{H_b^+}}{dx} = -D_{H_S^+}\frac{d\gamma_{H_S^+}}{dx}$$

$$G_{H_S^+} = F\gamma_{H^+}u_{H^+} = F\gamma_{H^+}\frac{FD_{H^+}}{RT}$$



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**Related projects**: FME HYDROGENi

I am doing PhD in Materials Chemistry at the Electrochemistry group with Truls Norby as my supervisor.

Bachelor in Environmental Engineering - Huazhong University of Science and Technology, China.

Master of Research in Green Chemistry: Energy and Environment - Imperial College London, UK.

## *Estimated progress of the PhD project:*

| Just started ... | < 50 % | > 50 % | Almost done ☺ |
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## Publications


- Wang, L.; Gu, Y.; Wei, J.; Wu, X. Li-Ni-Co-Mn oxides powders recycled from spent lithium-ion batteries for OER electrodes in CO2 reduction. *Environ. Technol.* Innov. 2020, 18, 13, Article. *DOI: 10.1016/j.eti.2020.100732.*


## Dissertation of MRes

- Using DFT to calculate the dual-atom catalysts for oxygen reduction reaction.