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Development of Catalysts for ORR HT-PEMFCs

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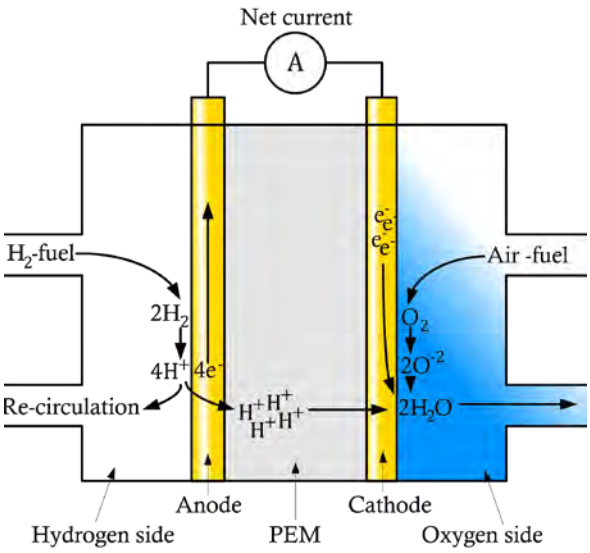
Abstract

The emergence of technologies for efficient zero-emission energy conversion using hydrogen Fuel Cells (*FCs*) holds great potential for future sustainable energy schemes.



This work aims at investigation and improvement of existing FC research platforms by tuning catalysts for the Oxygen Reduction Reaction (*ORR*) for Proton Exchange Membrane (*PEM*) FCs applications. The overall project aims at identifying catalysts for High Temperature (*HT*) PEMFCs, which are resilient towards the phosphate anion poisoning associated with PolyBenzImadazole (*PBI*) based PEMs.

A special focus concerns the understanding and improvement of Pt-based FC cathode catalyst material for the ORR, both in terms of stability (thermally, non-oxidizable), efficiency (activity, selectivity) and costs (non-toxic, cheap and abundant non-noble, scalability), *i.e.* the material should be capable of operating in highly acidic (pH~1), phosphate rich, and heated environments (>160 °C) for improved kinetics.

Different approaches to minimizing phosphate poisoning on Pt-based catalyst have been attempted. In this work electrochemical investigations of a Pt(111) single crystal model catalyst and subsurface alloys are used to elucidate the importance of tuning surface binding energies of oxygen species for optimum activity and phosphate resilience.