# Redox stability and bifunctionality of $LaNiO_3$-based oxygen electrodes

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One key issue in the development of Regenerative fuel cells (RFCs) is the availability of cheap, highly active electrocatalysts for both oxygen reduction and water oxidation.

Perovskite-type oxides, with the general formula $ABO_3$, are potential catalysts for next generation of regenerative fuel cells. In particular, $LaNiO_3$ has been recognised as one of the most promising oxygen electrodes.

In this work $LaNiO_3$ perovskite-type oxides, prepared by a self-combustion method [1, 2], have been simultaneously optimized for activity and stability as an anode and cathode material for water oxidation and oxygen reduction reaction (ORR), respectively. Extremely high surface area has been measured by BET analysis with matching electrochemical activity estimated by cyclic voltammetry and electrochemical impedance spectroscopy. A full electrochemical study has been conducted in order to kinetically characterize the prepared electrodes in alkaline media, using a Ni foam and carbon paper as support material for the electrodes. For $LaNiO_3$ deposits on Ni foam, low contact resistance between the oxide and support, possibility of high metal oxide loadings and dimensional stability were accomplished with remarkable stability in the region of oxygen evolution. For $LaNiO_3$ deposits on carbon paper, the preparation of porous gas-diffusion electrodes providing extended reaction zones in the solid/liquid/gas interfacial region. This type of electrode was reserved for the region of oxygen reduction in which good results were obtained, since for water oxidation the electrochemical oxidation of carbon sets a practical limit to the lifetime of the carbon supported catalysts. The electrode´s stability study was performed by potential cycling and at constant current density in the appropriate potential windows.

Enhanced activity for the oxygen reactions is obtained by substituting Ni by Co in $LaNiO_3$.

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