

Improving electrocatalytic activity of LaNiO₃ coatings by deposition on foam nickel substrates

C.O. Soares¹, M. D. Carvalho¹, M.E. Melo Jorge¹, A. Gomes¹, R.A.Silva², C.M. Rangel², M.I. da Silva Pereira¹

¹C.C.M.M., Departamento de Química e Bioquímica da Faculdade de Ciências da Universidade de Lisboa, Campo Grande, 1749-016 Lisboa, Portugal

²Laboratório Nacional de Energia e Geologia, Paço do Lumiar 22, Fuel Cells and Hydrogen Unit, 1649-038 Lisboa, Portugal

Email: cybelle_oliveira@hotmail.com

Search for new or improved electrode materials is restless in the field of power sources, namely of batteries and fuel cells. One of the challenging problems in the area is to find an effective electrode material that operates alternatively as anode and cathode and catalyses the oxygen electrochemical reactions (bifunctional oxygen electrode) [1]. Perovskite type oxide materials are considered potential candidates since they present high electrochemical stability, in strong alkaline solutions, and can catalyse oxygen evolution and reduction, simultaneously.

In this work LaNiO₃ oxide was prepared by a self-combustion method using citric acid. The electrodes were prepared by coating a nickel foam support with an oxide suspension followed by a heat-treatment. Electrochemical characterization was carried out by cyclic voltammetry. The electrodes electrocatalytic activity, towards the oxygen evolution reaction (OER) in alkaline medium, has been evaluated by steady state measurements.

The OER follows a first order kinetics, with respect to OH⁻ concentration, with Tafel slopes close to 60 and 120 mV for low and high overpotentials, respectively. These values are in accordance with those referred in the literature [2]. On the other hand the recorded apparent current densities are higher than those usually reported for the same oxide material. This result indicates that the increase on the electrode activity is mostly related to geometric factors, what can be associated with a high electrode/electrolyte contact area provided by the foam nickel substrate, what is in accordance with the roughness factor of 3463±250 estimated for the oxide coating.

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References

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