Development of Fe-N-C electrocatalysts for oxygen reduction reaction for application in electrochemical systems

Jéssica Fernanda Coelho[1], Elisabete Inácio Santiago[2], Thiago Lopes[3]

[1]Instituto de Pesquisas Energéticas e Nucleares (*CeCCO*) , [2]Instituto de Pesquisas Energéticas e Nucleares, [3]Escola Politécnica da Universidade de São Paulo

e-mail: jessica.fcoelho@usp.br

Jéssica Fernanda Coelho[1], Elisabete Inácio Santiago[1], Thiago Lopes[2]

[1]Nuclear and Energy Research Institute, University of São Paulo

[2]Polytechnic School, University of São Paulo

e-mail: eisantia@ipen.br

The increase in energy demand and the decrease in the supply of fossil fuels has made fuel cell technology evolve a lot in recent years. These devices have potential in various applications such as portable power, stationary electricity generation, vehicular propulsion and power plants. Despite the high efficiency and environmental benefits associated with their use, fuel cells still lack optimizations to make them commercially viable. These problems have been associated with the lack of catalysts that would allow these devices to compete with existing technologies. Therefore, Fe-N-C non-precious metal electrocatalysts work well for cathodic applications, especially in AEMFC given the favorable kinetics of the oxygen reduction reaction (ORR) in alkaline medium [1, 2].

In this work, we explore the synthesis of Fe-N-C electrocatalysts from a polymeric precursor formed by the oxidative polymerization of 1,5-diaminonaphthalene together with the transition metal salt that undergoes pyrolysis to obtain a catalyst with high surface area and conductivity.

The activity results obtained by RDE in alkaline medium showed that the half-wave potential for the Fe-N-C electrocatalyst in ORR is only ≈60 mV more negative than the commercial platinum catalyst. In addition, tests in AEMFC with Fe-N-C used in the cathode reached a peak power density of 679 mW cm^{-2}, revealing a good result for ORR and showing promise for this application [3].

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References:

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