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Iron oxide synthesized with the assistance of Açaí berry extract for electrocatalytic oxygen evolution reaction

Aline Gomes de Oliveira Cabral[1], Ana Paula Nazar de Souza[1] and Nakédia M. F. Carvalho[1]

[1] Department of inorganic chemistry, University of the State of Rio de Janeiro, RJ, Brazil
E-mail: alinegoc@gmail.com

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Iron oxide nanoparticles (FeONPs) are important for technological and scientific applications. As an alternative environmentally friendly materials, these nanoparticles can be synthesized with the assistance of plant extracts free of toxic chemicals in their composition. In addition, the impacts caused by the use of fossil fuels resulted in significant progress in the search for environmental solutions. In the search for clean energy sources, hydrogen gas fulfills this role as well as its combustion does not emit harmful gases into the atmosphere and does not contribute to climate change. The electrolysis of water produces H_2 and O_2 and, therefore, is an efficient method for producing green hydrogen. The kinetic barrier of such a reaction is considerably high and, to overcome this energetic barrier, catalysts capable of reducing the overpotential generated in the electrodes have been sought, in order to make water electrolysis a viable process. In view of such environmental problems, it is imperative to study economic and environmentally sustainable catalysts. In this study, two magnetic materials were produced from açaí seed extract (*Euterpe oleracea*) and applied as electrocatalysts in the oxygen evolution reaction (OER)[1]. The behavior of the nanomaterials prepared with the addition of ammonium hydroxide before or after the introduction of the iron (II/III) salts and açaí extract were investigated, and the efficiency of these materials in OER electrocatalysis was compared[2]. The materials, composed of maghemite (γ-Fe_2O_3) and hematite (Fe_2O_3), demonstrated an overpotential of 570 mV and 590 mV, respectively, at a current density of 10 mA cm^{-2}. An overpotential of 715 mV and 800 mV, respectively, was obtained at a current density of 50 mA cm^{-2}. The kinetics were measured using Tafel slopes, which were shown to be low: Tafel of 120 mV dec^{-1} for maghemite and 126 mV dec^{-1} for hematite were obtained. In conclusion, the iron nanomaterials prepared by a green route was able to produce oxygen by eletrocatalysis. The material synthesized with NH_4OH added after the iron (II/III) salts and açaí extract was the most efficient.

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