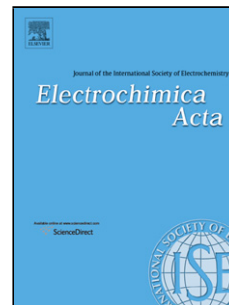


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A high-performance, bifunctional oxygen electrode catalysed with palladium and nickel-iron hexacyanoferrate

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Highlights

- A bifunctional O₂ electrode with Pd/C & Ni/Fe catalysts is characterised.
- The mixed catalyst showed low overpotentials and operates at high current density.
- The electrode was functional at a current density up to 1,000 mA cm⁻².
- 3,000 cycles for the O₂ electrode at 150 mA cm⁻² and low overpotentials.

Abstract

The development of air-breathing cathodes, which utilise atmospheric oxygen, enables the construction of lightweight, high energy density metal-air batteries and fuel cells. Air electrodes can be very lightweight and thin because the active material, oxygen, does not need to be stored inside the cell. However, air electrodes are restricted by poor reaction kinetics and low activity of many catalysts towards the oxygen evolution and reduction reactions. In addition, it is a challenge to maintain chemical and mechanical stability of the catalyst and supporting materials at oxidising currents under the strong alkaline conditions commonly used, and gas evolution. This paper reports a novel bifunctional oxygen electrode with remarkable stability, able to perform at current densities up to 1,000 mA cm⁻² and withstand 3,000 cycles continuously. The electrode is catalysed by a mixture of Pd/C and mixed nickel-iron hexacyanoferrate, which have high activities towards the ORR and OER reactions, respectively.

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