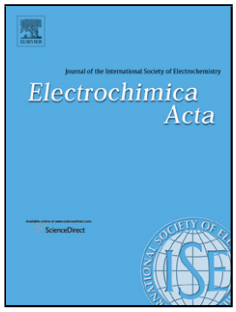

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Borohydride electrooxidation reaction on Pt(111) and Pt(111) modified by a pseudomorphic Pd monolayer

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Abstract

The borohydride oxidation reaction (BOR) on Pt(111) electrode modified by the electro-deposition of one pseudomorphic Pd layer (Pd_{1ML}/Pt(111)) has been studied in sodium hydroxide solution using cyclic voltammetry in static and dynamic conditions. The results are compared to those obtained at Pt(111) single crystal. Pd_{1ML}/Pt(111) shows an onset potential slightly shifted negative and the BOR current density is overall larger than observed at Pt(111), demonstrating the beneficial influence of the pseudomorphic Pd monolayer towards the BOR. Both surfaces are however very sensitive to surface poisoning by $BH_{x,ad}$ adsorbed intermediates and deactivation by accumulation of hardly-soluble BOR products (BO_x species). The forced convection created by rotation of the RDE can nevertheless limit the accumulation of BOR products in the interfacial region, which results in more sustainable BOR performances. Additionally, a modification of the surface signature in sulfuric acid is observed for the two electrodes after BOR, which could suggest that either BO_x or BH_{ads} species remain and block the electrode surface, or that the surfaces have been reconstructed/de-structured in the strong reducing environment of BOR experiments.

Keywords: Borohydride electrooxidation, single crystal, Palladium monolayer, Pt(111)