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RESUMOS

REALIZAÇÃO:

APOIO:

Ammonia electrooxidation on PtRu/C surfaces with Online Electrochemical Mass Spectrometry

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Humanity has had rapid development due to the use of fossil fuels, but the large-scale use of those fuels has caused global impacts, including excess polluting gases in the atmosphere, resulting in the worsening of the greenhouse effect [1]. A change in the global energy matrix is necessary to enable the transition to renewable and carbon-free fuels. One of the major highlights in this transition is hydrogen, but it still faces logistical problems regarding transportation and storage. Another molecule that can be used as a hydrogen carrier or as a fuel in fuel cells is ammonia. Ammonia has higher energy density than hydrogen and greater economic viability for transport and storage [2]. To enable the use of ammonia as a fuel in fuel cells, further studies are needed to optimize electrocatalysts for the ammonia oxidation reaction (AOR). This work studied AOR in an alkaline medium using a commercial PtRu catalyst supported on high-surface carbon, with and without heat treatment (300º C, H_2), and compared to the Pt/C catalyst. Cyclic voltammetry, chronoamperometry, and online electrochemical mass spectrometry (OLEMS) experiments were conducted to detect gaseous products formed during the potential sweep and to study the effect of these catalysts on AOR electrocatalysis. The results demonstrated that PtRu reduced the onset of AOR by 100 mV compared to the Pt catalyst. X-ray Photoelectron (XPS) analysis showed that the heat treatment performed on PtRu increased the metallic state of the material, and X-ray diffraction (XRD) confirmed alloy formation between Pt and Ru. These changes in the PtRu catalysts heat-treated increased the faradaic current density and inhibited poisoning during AOR. In situ mass spectrometry identified N_2, NO, N_2H_4, HN_3, and N_2O as reaction products, with nitrogen being the major product, a result like recent studies in the literature [3,4]. The findings of this study enlighten the possibility of using PtRu/C as an anode in direct ammonia fuel cells.

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