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A novel dealloying strategy for fabricating nanoporous silver as an electrocatalyst for hydrogen peroxide detection

Xilai Zou^{a,b}, Yongyin He^{a,b}, Peng Sun^{a,b}, Jie Zhao^{c*}, Guofeng Cui^{a,b*}

Abstract

A mild and low-cost strategy for fabricating nanoporous silver (NPS) thin films loaded on Ni wire were reported *via* co-electrodeposition of Ag-Sn alloy and subsequent dealloying in alkaline solution. Scanning electron microscope (SEM) and energy dispersive spectrum (EDS) were performed to investigate the morphology and composition of the electrodes. The crystal structures of the precursor alloy and NPS were examined by x-ray diffraction (XRD). After selectively etching the Sn out of the Ag-Sn alloy, an unordered three-dimensional bicontinuous nanoporous structure was observed, with a pore size of ~50-120 nm and a ligament size of ~40-200 nm. The NPS electrodes presented linear current response to hydrogen peroxide under the concentration ranging from 0.010 to 8.000 mM, with an excellent correlation coefficient (R^2) of 0.99998. The high sensitivity, reliability, anti-interference ability, stability and short response time indicate its potential in real-time monitoring H_2O_2 .

Keywords: Nanoporous silver; Dealloying; H_2O_2 detection; Sensor.

1. Introduction

Nanoporous metals, a subset of nanostructured materials, are of much interest for a wide range of potential applications, such as energy system [1, 2], catalysis [3, 4], and sensing [5, 6], because the nanopores not only increase the specific surface area, but also provide a pathway for reactant molecules [7]. The universal high catalytic activities of almost all nanoporous metals, compared to their bulk counterparts, are likely to be a result of increased surface defect sites, such as step edges and kinks. The formation of surface defect sites is closely associated with the evolution of porosity [8]. During the past few decades, enormous efforts have been devoted to developing the fabrication strategies of nanoporous metals, and now the main strategies include template synthesis

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