Short Communication

Preparation of highly dispersed Ru-Ni alloy nanoparticles on an N-doped carbon layer (RuNi@CN) and its application as a catalyst for the hydrogen evolution reaction in alkaline solution

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The hydrogen evolution reaction (HER) with transition metal alloys, as a substitute for platinum-based catalysts, under alkaline conditions is being increasingly studied. In this paper, a high dispersion of Ru-Ni alloy nanoparticles on an N-doped carbon layer (RuNi@CN) were synthesized by calcining a solid mixture of D-glucosamine hydrochloride (GAH), melamine, RuCl₃ and Ni(NO₃)₂·6H₂O in an inert atmosphere. The calcination temperature was an important factor that affected the electrocatalytic performance of RuNi@CN. The RuNi@CN electrocatalyst obtained under optimized conditions showed high efficiency and stable activity for the HER over a wide range of pH values, especially under alkaline conditions. The overpotentials of RuNi@CN-700 at 10 and 100 mA cm⁻² were 76.26 and 213.69 mV, respectively, with a Tafel slope of 66.35 mV dec⁻¹. Ruthenium is the cheapest platinum group metal, and its content in the catalyst was only 0.1209 wt%. Thus, this study shows the high activity and competitive price of this prepared catalyst.

Keywords: Ru-Ni alloy; Hydrogen evolution reaction, nanoparticles; electrocatalysis

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