PdAg Bimetallic Nanoparticles Encapsulated in Porous Carbon Derived from UIO-66 as Electrocatalyst for Oxygen Reduction and Hydrogen Evolution Reactions

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Developing dual functional electrocatalyst for both oxygen reduction reaction (ORR) and hydrogen evolution reaction (HER) is critical for promoting energy conversion efficiency in fuel cells and metal-air batteries, and produce hydrogen with high purity. Herein, PdAg bimetallic nanoparticles encapsulated in porous carbon have been prepared and utilized as effective electrocatalysts for both ORR and HER. The surface microstructure, crystal structure, as well as electronic charge states of the bimetallic particles encapsulated in porous carbon were studied by transmission electron microscopy (TEM), X-ray diffraction (XRD), and X-ray photoelectron spectroscopy (XPS), respectively. In the bimetallic Pd_xAg_{100-x} (x represents the initial atomic Pd ratio in PdAg alloys) series, the Pd₅₀Ag₅₀ sample exhibited the best performance, of which its ORR activity and long-term stability were superior to Pd/C in alkaline media along with its HER performance was comparable with Pd/C in acid solution. The study provides a reliable method for fabricating carbon substrate supported bimetallic alloys with good activity and robust stability toward ORR, HER and beyond.

Keywords: PdAg bimetallic nanoparticles; Porous carbon; Bifunctional electrocatalyst, Oxygen reduction reaction; Hydrogen evolution reaction

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