

Bifunctional Ru@Ir/C core-shell electrocatalyst for both hydrogen oxidation reaction and oxygen evolution reaction under acidic condition

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Fuel cells have drawn considerable attention due to their high power and energy density, and environmental friendliness. Platinum is known as the best electrocatalyst on both hydrogen oxidation reaction (HOR) and oxygen reduction reaction (ORR). However, in the point of a vehicle adopting polymer electrolyte membrane fuel cell (PEMFC) systems, performance on oxygen evolution reaction (OER) is required to mitigate carbon oxidation at anode caused by harsh conditions (start-up/shut-down, fuel shortage, sudden acceleration). The carbon oxidation by the cell reversal leads eventually to critical damage on the PEMFC electrode. Herein, we demonstrate a bifunctional Ru@Ir/C core-shell electrocatalyst for both HOR and OER. As synthesized Ru@Ir/C showed better OER performance than Pt/C and Ir/C with moderate HOR performance. Further line-scanning profile of energy-dispersive spectrum proves the Ru@Ir/C has a core-shell structure consisting of Ru core and Ir shell. The Ir shell performs a protective layer to prevent the dissolution of the Ru core and offers improved active sites than bare Ir/C due to the electronic effect caused by lattice mismatch between Ru and Ir.