Highly Durable PEMFC Anode Catalyst under Hydrogen Starvation by Pt-IrO_x Anchored on Defective Carbon

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Proton exchange membrane fuel cells (PEMFCs) is a practical alternative to provide electricity for automobiles without pollutant emission. But frequent start-up/shut-down, idling, and load changes often impose the anode to undergo fuel-starved condition. Then, typical Pt/C catalyst is rapidly degraded by carbon oxidation, presenting the cell voltage reversal, which can also lead to fatal accidents. The reversal tolerant anode (RTA) catalyst has been developed by adding IrO_x catalyst on the anode, oxidizing water to produce the required protons. In this study, Pt-IrO_x/C catalyst was fabricated by immobilizing Ir nanoparticles on the defective Pt/C, followed by oxidation of Ir. Although the defective Pt/C usually shows the lower maximum power density and poorer durability, the carbon defects helped the Ir nanoparticles to be immobilized on the carbon surface more tightly. The resulting Pt-IrO_x/C catalyst showed higher activity for oxygen evolution reaction and better tolerance against CO poisoning, resulting in a superior reversal tolerance. This work would provide a useful direction for preparing highly durable anode catalyst working on transient PEMFC conditions.