Ir-Based Intermetallic Nanoparticles: Efficient and Durable Catalysts for Oxygen Evolution Reaction

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Oxygen evolution reaction (OER) plays a crucial role in water splitting technology for efficient, clean hydrogen production, which is essential to realizing a sustainable energy future. However, the active and stable electrocatalysts in corrosive acidic media are limited to costly Ir-based materials. Here, we present chemically stable, atomically ordered Ir-Sn intermetallic nanoparticles dispersed on carbon support (*O*-IrSn/C) as a high-performing OER catalyst. We prepared *O*-IrSn/C catalysts with an average nanoparticle size of 4.8 nm, by the combination of impregnation-reduction method and sacrificial silica layer. These *O*-IrSn/C catalysts exhibited superior OER activity to disordered IrSn alloy catalysts as well as commercial Ir/C and IrO_2 catalysts. Importantly, the Ir mass activity of *O*-IrSn/C is 10- and 66-times higher than those of Ir/C and IrO_2. Furthermore, the *O*-IrSn/C showed a minimal activity loss among the catalysts during the long-term stability test. The enhanced OER activity and stability can be attributed to the intermetallic arrangement. These intermetallic nanoparticles can provide a new direction on the catalyst optimization for water splitting.