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Nickel-iron diselenide hollow nanoparticles with strongly hydrophilic surface for enhanced oxygen evolution reaction activity

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ABSTRACT

It is highly desired while remains challenging to explore stable, earth-abundant, low-cost, and high-efficient electrocatalysts towards eco-friendly utilization of green energy. In this study, we report a one-pot hydrothermal synthesis of polyvinyl-pyrrolidone (PVP)-decorated nickel-iron diselenide hollow nanoparticles with strongly hydrophilic surface, the hollow architecture of which could be assigned to the Kirkendall effect. As the lactam groups in PVP are strongly polar and incline to interact with water molecules, the surface wettability of the electrocatalyst was effectively improved after PVP was introduced. Compared with the pristine one, such PVP decorated nickel-iron diselenide hollow nanoparticles demands only a low overpotential of 255 mV to drive a geometrical current density of 10 mA cm^{-2} in 1 M KOH aqueous solution. Moreover, this PVP involved electrocatalyst yields a low Tafel slope of 56 mV dec^{-1} and possesses remarkably long-term durability. This surface engineering insight provides an indication for fabrication of high-efficient OER electrocatalysts.

Keywords: Electrocatalyst, Selenide, Hollow structures, Hydrophilic surface, Kirkendall effect

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