Phosphorous Modified Metal Boride as High Efficiency HER Electrocatalyst

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The investigation on highly active and durable electrocatalysts for the hydrogen evolution reaction (HER) is of great significant for renewable energy technologies. Herein, we report the fabrication of a series of amorphous $\text{Co}_{10-x}\text{Ni}_x\text{-B-P}$ nanocomposites via a facile chemical reduction and phosphorization method. Compared to the Ni-B-P, Co-B-P, and other $\text{Co}_{10-x}\text{Ni}_x\text{-B-P}$ electrodes, the $\text{Co}_{8.5}\text{-Ni}_{1.5}\text{-B-P}$ nanocomposite catalyst exhibited the highest HER electrocatalytic activity in alkaline solution. The overpotential of $\text{Co}_{8.5}\text{-Ni}_{1.5}\text{-B-P}$ is 145 mV at a current density of 10 mA cm^{-2} , and a low Tafel slope of 60.5 mV dec^{-1} is realized. $\text{Co}_{8.5}\text{-Ni}_{1.5}\text{-B-P}$ also exhibits superior durability, showing no obvious degradation after 50 hours. These new phosphorous-modified borides are proved to be a new low-cost and high-efficiency catalyst system for water splitting.

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Keywords: Boride, hydrogen evolution reaction, phosphide, HER catalyst, water splitting

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