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Acid-engineered Defective MoS₂ as an efficient electrocatalyst for Hydrogen

Evolution Reaction

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Abstract

Here we report a dramatically enhanced hydrogen evolution reaction (HER) catalyst by acid etched MoS₂ (A-MoS₂). For the etching and oxidation effects of HNO₃, the active site and electrical transport are significantly improved by simply controlling of processing time. The A-MoS₂ exhibits promising electrocatalytic performance, including much smaller onset overpotential (~80 mV), an overpotential of 210 mV at 10 mA/cm², and a Tafel slope of 97 mV/dec (the pristine MoS₂ 180 mV/dec). The enhanced HER performance of MoS₂ may be attributed to the increased edge S atoms and the charge induced by the O doping.

Keywords: MoS₂; Nanoparticles; Defects; Electrocatalytic; Energy storage and conversion

1. Introduction

Recently, MoS₂ had been developed to replace the Pt-based materials to apply in HER.[1-4] In the previous works, theoretical calculations and experimentation works had demonstrated that the edge unsaturated S atoms are the active sites for HER.[5] Nevertheless, the poor electrical conductivity of MoS₂ is another factor to suppress the electrocatalytic activity. To enhance the HER performance of MoS₂, numerous researches have been conducted. Dai et al. prepared MoS₂ nanosheets on graphene to increase

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