Electrochemical hydrogen evolution over hydrothermally synthesized re-doped MoS2 flower-like microspheres

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In this research, we report a simple hydrothermal synthesis to prepare rhenium (Re)- doped MoS2 flower-like microspheres and the tuning of their structural, electronic, and electrocatalytic properties by modulating the insertion of Re. The obtained compounds were characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), high-resolution transmission electron microscopy (HRTEM), Raman spectroscopy, and X-ray photoelectron spectroscopy (XPS). Structural, morphological, and chemical analyses confirmed the synthesis of poorly crystalline Re-doped MoS2 flower-like microspheres composed of few stacked layers. They exhibit enhanced hydrogen evolution reaction (HER) performance with low overpotential of 210 mV at current density of 10 mA/cm2, with a small Tafel slope of 78 mV/dec. The enhanced catalytic HER performance can be ascribed to activation of MoS2 basal planes and by reduction in charge transfer resistance during HER upon doping.

HER

Hydrogen evolution reaction

Hydrothermal synthesis

Molybdenum disulfide

Rhenium doping

disulfide

hydrogen

microsphere

molybdenum

rhenium

catalysis

chemistry

electrochemistry

kinetics

spectroscopy

synthesis

X ray diffraction

Catalysis

Chemistry Techniques, Synthetic

Disulfides

Electrochemistry

Hydrogen

Kinetics

Microspheres

Molybdenum

Rhenium

Spectrum Analysis

X-Ray Diffraction