

Platinum-deposited metallic Molybdenum ditelluride for Hydrogen Evolution Reaction

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Electrochemical catalysts based on transition metal dichalcogenides (TMDs) have been intensively studied in hydrodesulfurization, hydrogenation, and the hydrogen evolution reaction (HER) [1-3]. Moreover, TMDs have polymorphism, which has stimulated extensive studies on tuning of surface electronic structures for active HER. The polymorphism in TMDs provides an opportunity for new hybrid catalysts with TMDs and other catalytic metals via surface engineering that can create novel facets of the catalytic metals for active HER. Here, we report a hybrid catalyst with monoclinic MoTe₂ and platinum (Pt) for the HER. Pt atoms were decorated on the surface of monoclinic MoTe₂ that has an atomically-distorted lattice structure, which produces a distinct Pt-Te alloy layer. The Pt/MoTe₂ hybrid catalyst exhibits an active HER with a Tafel slope of 22 mV per decade and an exchange current density of 1.0 mA/cm², which are the best values among those reported for TMD-based catalysts. The decoration of catalytic metals on atomically-distorted metallic TMDs realizes rich catalytic active sites on large basal planes for efficient hydrogen production.

References

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Figures

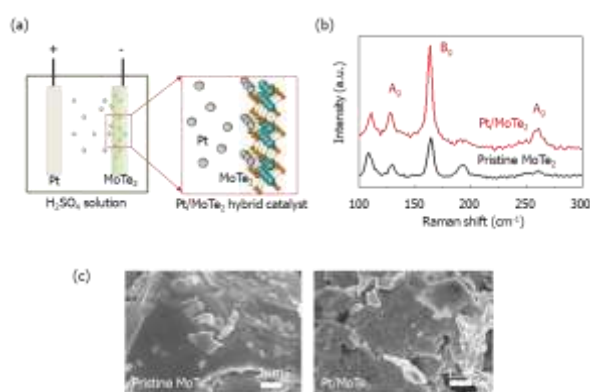


Figure 1: Preparation of Pt/MoTe₂ hybrid catalyst a) Schematic picture b) Raman spectra c) Scanning electron microscope (SEM) images

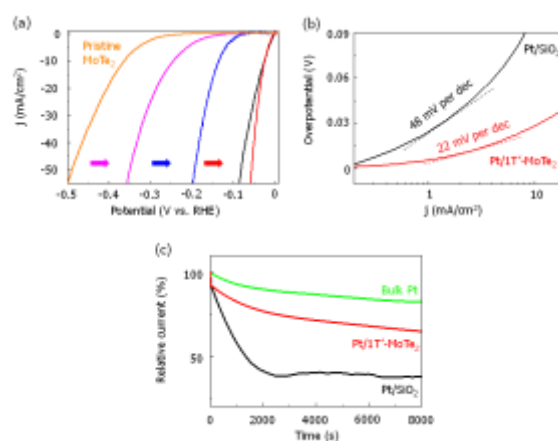


Figure 2: HER measurements. a) Polarization curves b) Tafel plots c) A stability comparison